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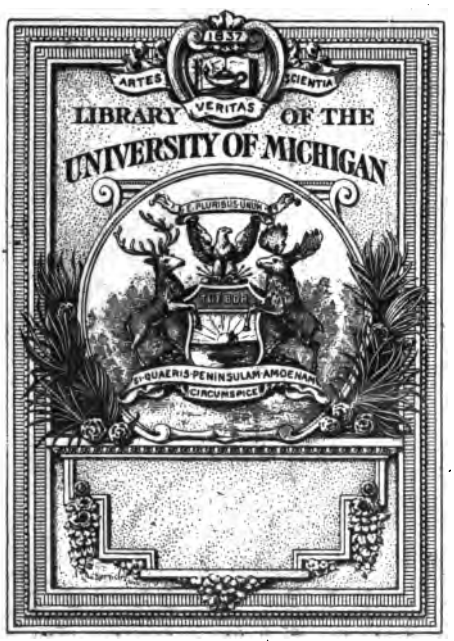

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HOLD SHELF
JUN 28 1990

TRANSACTIONS

OF THE

SOCIETY

FOR THE

Promotion of Useful Arts,

IN THE

STATE OF NEW-YORK.

VOLUME IV—PART II.

ALBANY:

PRINTED BY WEBSTERS AND SKINNERS.

1819.

ADVERTISEMENT.

AFTER an interval of several years, the Society for the Promotion of Useful Arts are enabled to present to the public, the second part of the fourth volume of their Transactions.

The original papers, contained in this half volume are, with two or three exceptions, the productions of Members of the Society, and the authors of each are responsible for their individual statements and observations.—It is proper, however to advert to the articles communicated by Mr. Spafford. These were received by the Society some years ago, and it might seem that the necessity for their insertion in the Transactions is superceded by the subsequent publications of Pitkin and Seybert. The Committee have however been induced to give them a place, from the circumstance, that the first table is more minute than the corresponding one in the authors above named, whilst the last exhibits on one page, what is scattered over many.

As to the Selections, it may be observed, that the aim of the Committee of Publication has been not only to insert such articles as promised to be of permanent utility, but also those which might instruct the Farmer and Horticulturist concerning the evils or difficulties under which, they at present seem particularly to labour. The disproportioned length of the Essay on the Diseases of Sheep would have prevented its insertion, had the Committee been aware of its great length. They cannot however much regret this circumstance, as the opportunity seldom occurs, of examining the investigations of practical men, clothed in a proper form and in a scientific manner by an enlightened and distinguished scholar.

Library Institute 8-5-1891

182053

ADVERTISEMENT.

It might here be proper to close these observations, but as this will probably be the sole publication of the Society for several years to come, some additional remarks will doubtless be pardoned.

The Legislature in the year 1812, did the Society the honour of making it the organ of the State in dispensing the highest premiums for the encouragement of Domestic Manufactures. While directing their best endeavours to the discharge of this duty, the Members were not unmindful that other subjects required honorary as well as pecuniary rewards for their proper encouragement. The Memorials of the Society to the Legislature, printed in the Appendix to this part, and also in that to the first part, bear witness to the anxiety that was felt, on this point. Agriculture, the Arts, and Domestic Manufactures were in their view, all worthy of distinguished notice. It is gratifying to find that the Legislature have been induced to turn their attention to the improvement of these great branches of natural industry, and although the Society is no longer, as formerly, the organ for dispensing the bounty of the State, yet the Members do not less warmly feel pleasure at the present ardent devotion to Agriculture. While other bodies, however, possess the patronage and favourable eye of the State, it cannot be expected that the exertions of the Society will be either very extensive or conspicuous. Like most literary and scientific institutions in this country, it has now to depend on the talents and industry of its Members alone, and like them also, it must be liable to seasons of occasional depression.

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SKETCHES

Of the Weather and Progress of Vegetation at Kingston in Ulster County.

BY CHRISTOPHER TAPPEN, Jun.

Read before the Society, January 28th, 1817.

FOREST TREES.

Spring of 1802.		
March	30.	Sugar Maple and Button Wood—bud.
April	10.	Yellow Willow in leaf.
May	3.	Wild Plum and Sassafras in flower.
	4.	Trembling Poplar or Aspen, } leaf.
	5.	Alder, Birch, Black Oak, } leaf.
	9.	Elm, Dogwood, Mulberry, } flower.
	11.	Bass Wood, } leaf.
	13.	White Oak, } leaf.
	14.	Walnut, Chesnut, } flower.
	22.	Wild Cherry, } flower.

FRUIT TREES AND SHRUBS.

April	20.	Peach, } blossom.
	26.	Plum, } blossom.
	27.	Pear, } blossom.
	29.	Red Currant, leaf.
May	1.	Apple Orchards, leaf.
	12.	blossom.
	6.	Garden Strawberry, } blossom.
	22.	Wild do. } blossom.
	8.	Gooseberry, } blossom.
	30.	Raspberry, } blossom.

FLOWERS FULL BLOWN.

May	4.	Tulip,
	6.	Lilac,
	19.	Snow Ball, and Fleur de Lis,
	21.	Honeysuckle.
April	30.	Asparagus on table.

The soil of this place is sandy and its situation generally elevated. The weather this season was dry and cold. The predominant wind from the northeast. The average temperature of the month of May was 60 deg.

Spring of 1802 and 1804, compared.

Atmosphere by Farenheit's scale.

May 1802.		May 1804.	
Sunrise	49	8, A. M.	65
2, P. M.	67		76
8, P. M.	50		60

Vegetation	1802.	1804.
Lilac buds	March 23	April 12
Gooseberry, leaf,	24	14
Peach, blossom,	April 20	May 6
Plum, do.	26	5
Pear, do.	27	6
Cherry, do.	May 1	5
Trembling Poplar, leaf,	4	6
Mulberry, flower,	9	9
Lilac,	6	10
Dogwood,	5	17

The result is, that although the atmospheric heat was less in 1802 than in 1804, yet the vegetation of 1802 was most forward. There was no frost in May of either year. The prevailing winds in both seasons were northeasterly. But the winter of 1804 was unusually severe; and may have retarded vegetation by the severity and longer continuance of the frost in March and April. There was a fall of one inch of snow, April 6, 1804, and then nothing had yet vegetated. On the 17th of the same month, there was a severe hail storm.

Summer Vegetation.

Rye in blossom,	June 1, 1802.
	6, 1804.
Wheat, do.	8, 1802.
Corn, planted,	May 18, 1804.
hoed,	June 11, 1804.
Grasses, blossom,	14, 1804.
Mulberry, ripe,	30, 1804.
Flax, blossom,	July 8, 1816.
pulled,	26, 1816.
Oats, cut,	August 12, 1816.
Barley, cut,	14, 1816.
Common Raspberry, ripe,	July 13, 1816.
Blackberry,	26, 1816.
Whortleberry,	Aug. 9, 1816.
Field Pease, gathered,	17, 1816.

Summer of 1804 and 1816 compared.

	1804.	1816.
Wild strawberries, ripe,	June 10.	June 24.
Common cherries, do.	27.	July 8.
Red clover grass cut,	28.	15.
Rye, cut,	July 17.	25.
Wheat, cut,	24.	Aug. 5.

The result shews a tardiness of vegetation in 1816, of about fourteen days, and is easily accounted for by the remarkably cold and dry weather which distinguished this season. The greatest heat this summer was Aug. 18, 92°, but on the 20th it fell to 64°, and on the 21st there was a severe frost, destructive to corn and buckwheat. There has been frost in every month this season.

Might not the annual variations of the weather during harvest be noticed by the flowering of the bass wood as a sort of standard? This tree opened its flower in 1816, on the 20th July.

Statement of the Gold, Silver and Copper Coins, struck at the Mint of the United States, from the commencement of the Institution, to the 31st Dec. 1807—Communicated to the Society, by HORATIO G. SPAFFORD, March 11, 1817.

	GOLD COINS.						SILVER COINS.							
From what time to what time.	Eagles	Half Eagles	Qr. Eagles	Pieces coined	Dollars	C.	Dollars	Half Dollars	Qr. Dollars	Dismes	Half Dismes	Pieces coined	Dollars	C.
31st July, 1795 to 31 Dec. 1795	2,795	8,707		11,502	71,485		204,791	323,144			86,416	614,351	370,683	80
31st Dec 1795 to 29 Nov. 1796	6,080	3,399	66	9,545	77,960		68,150		5,894	22,135	10,230	106,409	72,348	50
29th Nov. 1796 to 31 Dec. 1797	9,177	6,406	1,756	17,339	128,190		12,546	3,918	252	25,261	44,527	86,504	19,320	45
1st January to 31 Dec. 1798	7,974	24,867	614	33,455	205,610		327,536			27,550		355,086	330,291	
to 31 Dec. 1799	17,483	7,451	480	25,414	213,285		423,515					423,515	423,515	
to 31 Dec. 1800	25,965	11,622		37,587	317,760		220,920			21,760	24,000	266,680	224,296	
to 31 Dec. 1801	29,254	26,006		55,260	422,570		54,454	30,289		34,640	33,910	153,293	74,758	
to 31 Dec. 1802	15,090	53,176	2,612	70,878	423,310		41,650	29,890		10,975	13,010	95,525	58,343	
to 31 Dec. 1803	8,979	33,506	423	42,908	258,377	50	66,064	31,715		33,040	37,850	168,669	87,118	
to 31 Dec. 1804	9,795	30,475	3,327	43,597	258,642	50	19,570	156,519	6,738	8,265		191,092	100,340	50
to 31 Dec. 1805		33,183	1,781	34,964	170.367	50	321	211,722	121,394	120,780	15,600	469,817	149,388	50
to 31 Dec. 1806		64,093	1,616	65,709	324,505			839,576	206,124			1,045,700	471,319	
to 31 Dec. 1807		8,4093	6,812	90,905	437,495			1,051,576	220,643	165,000		1,437,219	597,448	75
Grand Total,	132,592	386,984	19,487	539,063	3,309,557	50	1,439,517	2,678,349	561,045	469,406	265,543	5,413,860	2,979,170	50

(Statement continued.)

From what time to what time.	COPPER COINS. Cents	Half Cents	Pieces coined	Dollars	Cts	Total. Total Pieces coin'd	Total Dollars	Cts
1st March, 1793 to 31 Dec. 1795	1,066,033	142,534	1,208,567	11,373		1,834,420	453,541	80
31st Dec. 1795 to 29 Nov. 1796	974,700	115,480	1,090,180	10,324	40	1,206,134	160,632	90
29th Nov. 1796 to 31 Dec. 1797	897 510	107,048	1,004,558	9,510	34	1,108,401	157,020	79
1st January to 31 Dec. 1798	979,700		979,700	9,797		1,368,241	545,698	
to 31 Dec. 1799	904,585	12,167	916,752	9,106	68½	1,365,681	645,906	68½
to 31 Dec. 1800	2,822,175	211,530	3,033,705	29,279	40	3,337,972	571,335	40
to 31 Dec. 1801	1,362,837		1,362,837	13,628	37	1,571,390	510,956	37
to 31 Dec. 1802	3,435,100	14,366	3,449,466	34,422	83	3,615,869	516,075	83
to 31 Dec. 1803	2,471,353	97,900	2,569,253	25,203	03	2,780,836	370,698	53
to 31 Dec. 1804	756,838	1,055,312	1,812,150	12,844	94	2,046,839	371,827	94
to 31 Dec. 1805	941,116	814,464	1,755,580	13,483	48	2,260,361	333,239	48
to 31 Dec. 1806	348,000	356,000	704,000	5,260		1,815,409	801,084	
to 31 Dec. 1807	727,221	476,000	1,203,221	9,652	21	2,731,345	1,044,595	96
Grand Total,	17,687,168	3,402,801	21,089,969	193,885	68½	27,042,892	6,482,615	38½

COPPER COINAGE commenced 1st March, 1793.

SILVER COINAGE, 15th October, 1794.

GOLD COINAGE, 31st July, 1795.

Comptroller's Office,

March 19, 1808,

AND. ROSS.

IMPORTATIONS

OF

Steel and some Descriptions of Iron,

INTO THE

UNITED STATES,

From 1805 to 1814, inclusive.

From the Hon. WILLIAM H. CRAWFORD, Sec'ry of the Treasury, 2 Mo. 1817, at the request of H. G. SPAFFORD, and by him presented to the Society for the Promotion of Useful Arts.

☞ BAR IRON, by far the most important article, is omitted in this Report, it paying duties ad valorem, and no account of the *quantity* being kept in the Treasury Books.

Albany, 3 *Mo.* 11, 1817.

REMARKS

On the extraordinary Cold *in the Month of February*, 1818.

BY SIMEON DE WITT, Esq.

Read before the Society, February 17, 1818.

THE extraordinary coldness of the morning of the 11th of this month, (February 1818,) which will probably long hereafter be alluded to, as the *cold Wednesday*, has occasioned various accounts of its intensity. The differences of the thermometrical observations which have been published, are no doubt in a great measure owing to the positions of the thermometers; but there is one circumstance of importance in such observations, and which I believe is not sufficiently regarded, to which I wish to draw the attention of gentlemen who undertake to make and report them. It is the accuracy of the instruments used. Every thermometer kept for sale, is by the generality of buyers, presumed to be correct. It is certain that some are not so. No person ought therefore to use one without carefully examining it.

A thermometer to be true must possess these properties: The bore of the tube must be of uniform diameter, as the graduation is always of equal degrees, or at least so intended to be. It must be a perfect vacuum as it regards air, and be hermetically sealed, and the freezing and boiling points must be correctly marked.

In order then to be sure of having a true thermometer on Farenheit's scale, these directions are to be

observed. Obtain one which is graduated upwards, some degrees above 212°, the temperature of boiling water, and downwards below the freezing point, for our climate 40 below 0, should be chosen. Turn the instrument upside down, and if the mercury breaks off at the bulb and flows freely to the end of the tube, and if on reversing it, the mercury in the tube unites again with that in the bulb, you are sure that there is no air in it. Make a thick mixture of snow and water, or if snow is not to be had, of pounded ice and water; immerse in it the ball and tube, at least as far as they contain the mercury, which must then stand precisely at the degree marked 32. Again, gradually heat the thermometer at a fire, as a precautionary measure, and then immerse it in rain or river water while in the act of boiling. The most convenient vessel for this purpose will be a quart, half gallon or gallon measure, set on a chafing dish. If the thermometer be true, the mercury will then stand exactly at the degree marked 212. Thermometers not graduated so high should not be subjected to this test; for, not containing room for the expansion of the mercury, they must in that case necessarily burst. The other requisites, the uniformity of the diameter of the tube, and the equality of the degrees, are seldom perceptibly erroneous. Bare inspection, by an accurate eye, may detect errors of consequence in them.

The thermometer I use, has in this manner, been proved to be without a perceptible defect. On the night of the 10th instant, I had it placed on the outside of the back stoop, or rear portico of my house,

a wooden inclosure, exposed to the west, in an open yard, sheltered only by a wood house, distant from it about 70 feet, on the next adjoining street. In this position, the mercury on the morning of the 11th instant, at 8 o'clock, stood at 26; on the 12th at 20, and on the 13th, at 14° below 0.

About thirty years ago a thermometer kept in State-street, shewed 25° below 0; since that, the weather has not been observed to be so cold till this winter. It is very probable that earlier in the morning, my thermometer might have shewn a degree or two lower, which then would have nearly agreed with Mr. Buel's, which at 7 o'clock stood at 27 1-2. He has since informed me that he has examined it by the prescribed tests, and found it correct.

Thermometers should be kept at some distance from massy walls, especially such as are constructed of stone or brick; for, on sudden changes of the weather, they will retain the anterior temperature, which, instead of that of the atmosphere, will more or less be indicated by thermometers near to, or in contact with them. They should be kept where there is no reflection or radiation of heat from neighbouring bodies, and where there is no obstacle to a free circulation of air. Cities are unfavorable to such observations, as the artificial heat kept in them in winter, and the absorption and consequent radiation of heat by the structures in them, must to a considerable degree, especially in summer, affect the surrounding atmosphere. Hence it will be found that the leeward parts of a city will show a higher temperature than those in its windward extremities. Observations

made in places detached from cities and villages are therefore most to be relied on. I therefore think that the observation of the weather on the morning of the 11th inst. by Mr. Bryan, at the country seat of the late Gen. Schuyler, is most to be relied on as a true statement of the weather. It was 32° below 0. I have since seen his thermometer, which appears to be of the best construction, and placed in a proper situation, and am informed that it has been properly examined and proved to be correct. It is said Mr. Ames's stood at 34°; his was also in the outskirts of the city.

This communication is made with the view of having this uncommon state of the weather recorded among the transactions of the society, as well as to inculcate the necessity of having thermometers from which public reports are intended to be made, critically examined, before they are used, and of selecting proper places for their situations.

NOTE

On the Method of cultivating TURNIPS, *on the Melvill Farm in Pittsfield, (Mass.) and which received the Premium from the Mass. Agricultural Society,* 1817.

BY THOMAS MELVILL, JUN.

Read before the Society, April 21, 1818.

Pittsfield (Mass.) April 19, 1818.

SIR,

When in your city a few days since, and conversing with P. Gansevoort, Esq. on the subject of Agriculture, he expressed an opinion that it might be agreeable to your Society, to receive a note of the method we followed on my father's farm, in this village, for the culture of turnips on *old improved land*, and which received the premium from the Mass. Agricultural Society in 1817.

I am therefore induced to transmit the enclosed note on the subject, as taken from our Farm Journal, and should be extremely gratified should your Society consider it merited a place on their files for publication.

I am sir,
very respectfully,
Your most obedient.

THOMAS MELVILL, JUN.

To the Sec'ry N. Y. Ag. Society, Albany.

PERSUADED that the opinion prevalent in this part of the country, relative to the cultivation of turnips, was erroneous; that with not much more labor and expense, than for potatoes, *old improved land*, could be made to produce, as in Europe, a much greater quantity than in the usual manner of raising them, *on new land recently burnt over*, or on *bog land;* I determined to appropriate an acre on the farm under my care, to this experiment.

For this purpose, I selected a piece in a lot which was probably one of the first cleared on the farm, and has certainly been (from what I could learn from the neighbours) as often under tillage as any other part of it, and quite impoverished: the soil, a gravelly loam: in 1813, it was sowed to grain and stocked; 1814 and 1815 mowing: 1816 half the lot was planted to potatoes, manured in the hill, the other half was continued in grass, and plaistered.

On the 20th May, 1817, I ploughed up, half an acre of the potatoe land and half an acre of the sward land, immediately adjoining. In this state it remained till the 20th June, when I ploughed it a second time, and formed it into *drills* of 28 inches. The next day, carried on 14 loads of hog manure, 7 of sheep manure, and 7 of common barn yard manure, and spread it *immediately* on the top of the drills; and in order the better to preserve the whole strength of the manure, in the soil, as well as to produce quick vegetation, sowed the seed on the manure, and rolled it in, the same day. The following day, sowed on to the piece 30 bushels slacked lime, and 15 bushels house ashes; and to extend the experi-

ment, divided these top dressings equally, on the different kinds of manure (so as to ascertain which manure, and which top dressing was best suited to this culture) left about two square rods without either manure, or top dressing, and marked off three drills, not to be hoed at all.

In a few days, had the satisfaction to see that the seed had taken well; that part which had *sheep manure*, and *ashes*, appeared the best and most rank, while that without manure, could hardly be perceived to have pierced the soil. On the 15th of July examined the field, and found no signs of worms; the part with sheep manure and ashes, continued the most promising, that with hog manure and ashes next: we now howed out the field (with a small hoe, about 5 inches wide, and 4 inches deep, well steeled, and sharp, on sides and face) so as to leave but one plant in 4 or 5 inches of space, as also, *to take the earth from* the remaining plants. After this first hoeing, the drills with *hog manure* and *ashes*, began and continued to take the lead; then those with neither manure or top dressing, and those not hoed, very diminutive in comparison.

The 21st July, harrowed again *between* the drills, and the 26th hoed out the field a second and last time.

The 1st August, began to thin out by hand, (at which time the turnips, were in size from 2 and 1-2 to 3 and 1-2 inches, except those not manured and those not hoed, both which were quite small) and we then continued to thin out every few days to feed to the stock; in this manner 63 bushels were used,

previous to the examination of the field, in the first week of October, by Messrs. Strong and Osborne, for the purpose of ascertaining its produce, which they estimated to be 800 *bushels*.

On the 5th of Nov. began to take in the crop, and we had *twenty-five ox cart loads*, which we estimated good 30 bushels each. They weighed about 40 pounds the bushel, making at least 15 tons produced from one acre; the average weight of the turnips, is I think from 4 1-2 to 6 pounds; several weighed 10 pounds, and one 13 1-4 pounds. The expence of cultivation has been as is below stated, $17 75.

Ploughing, harrowing and drilling for crop, Getting out and spreading manure,	$7	50
Seed and rolling, - - -		50
Lime and ashes, - - -	4	
Sowing lime and ashes, - -		25
Harrowing between drills, twice, -	1	
Hoeing and clearing, a man and boy, twice,	4	50
	$17	75

They were harvested and got in, in two days and an half, by a man and boy, with an ox team.

The satisfactory result of this experiment (entirely novel in this part of the country,) may I hope, induce many of my brother farmers to turn a small portion, at least, of their *old natural grass lands* into turnip fields: the trial will not require much extra labor or expense, and experience will prove to them, that they can, not only keep their stock *cheaper*, as

well as *better*, but they can raise a much greater number, with a given quantity of land; besides the incalculable advantage of putting land in good heart for grain, especially for wheat.

Necessity will, ere long, oblige us to extend our *grain crops*; for we may be assured, that without them, we can neither keep the land clear, or in good heart, nor can we keep a large stock of cattle to advantage.

OBSERVATIONS

On the Use of Blue Clay, *in the Removal of Grease, &c. from Beaver Skins.*

By WILLIAM MAYELL.

Read before the Society, March 17, 1818.

THE fur on beaver skins, which in this country is exclusively used in the manufacture of hats, is very frequently besmeared, or clotted in spots, with a certain substance that renders such parts unfit for the hatters' purpose. A method to remove this substance, usually supposed to be grease, has long been a desideratum with hatters. Upon the supposition that the clotted spots of the fur on beaver skins is grease, alkali or soap is generally used, but with only a partial effect. Sometimes dry wood ashes, and at other times buckwheat batter, have been used; but these very rarely effect the object desired. Caustic alkali destroys the texture of the fur, and soap is but a partial cleanser; dry wood ashes and buckwheat batter are applied without reason, and without any beneficial result.

I have been informed that the manufacturers of woollen cloth frequently labour under difficulties from the want of a something to cleanse the cloth from the oil, that is applied to the wool in carding and spinning. The clothiers, after having tried to cleanse the cloth from the grease, find it set, as they express themselves, which prevents them from dressing the cloth in a manner equal to the English. A

very liberal use of soap injures the cloth. In England the clothiers invariably use fuller's earth, which is thought to exist no where but in that country, and that government, always intent upon nursing and cherishing its manufactories, has prohibited the exportation of that article. This highly valuable and useful earth consists principally of argil. Besides being useful to the clothier, it is advantageously employed in domestic affairs, such as the taking out of grease spots from garments, and from off the floor of rooms.

In this country, potter's clay, which like the fuller's earth of England, consists chiefly of argil, is frequently employed to take out grease from the floors of our houses, and is found to answer that purpose well, and it might probably answer as well the clothiers' purpose. The experiment I think might very properly be made. Conceiving that the blue clay, which abounds about Albany, as well as in other parts of this country, would absorb grease as well as the fuller's earth of England, because both consist of argil, I made an experiment upon some beaver skins, the fur of which was very greasy, and found it answered my expectations fully. I applied it to the grease spots, after having mixed it with water to the consistence of a very thin batter, and then suffered it to dry on the skins. After it was dry I brushed and beat the skins, and found the fur upon which it had been applied as clear and free from grease and dirt as skins that were unsullied with either.

On the Establishment of a MERIDIAN LINE, *on the Public Square, in the City of Albany.*

By SIMEON DE WITT, Esq.

Read before the Society, March 31, 1818.

THE following communication is made not so much for instruction in any thing relating to the arts as to have preserved among the transactions of this Society the result of observations that may be of use.

If for no other purpose than for ascertaining at all times with ease the variation of the magnetic needle, the establishment of a meridian line at certain places, and particularly in the neighborhood of academic or scientific establishments, is desirable.—With this view, on the 1st, 2d, 3d and 4th of October last, I made observations on the pole star from the south side of the public square in this city, in a range with the academy. The observations were made on the greatest eastern azimuth of the star with a transit instrument adjusted with the greatest care. The polar distance of the star in the beginning of 1817, as given by the nautical almanack, was 1° 40′ 3″ 9, and the annual variation—19″ 45; which for nine months is—14″ 58. This correction applied made the polar distance on the first of October, 1° 39′ 49″ 32. The latitude of the place is 42° 39′. From these data the greatest azimuth of the pole star here, was then ascertained to be 2° 15′ 01″. By this angle then the true meridian was laid off from the line of the azimuth taken from the mean of the observations and transferred to the westernmost edge of the basement story of the academy, from

which it strikes the south side of State-street, eleven feet nine inches southeasterly from the brick house belonging to John Van Schaick, Esq.

As this meridian line crosses the public square diagonally, it has a scope sufficiently large for its purposes through a space that will perhaps never be obstructed; and the two buildings by which its direction is indicated being constructed of the most durable materials, this was considered as the most eligible place for its establishment. The officers of the academy may here with little trouble, and it is hoped they will, make stated observations on the variations of the needle, and keep a record of them as long as that institution shall exist. The use of such records, in retracing ancient land marks in our country is obvious. Moreover, by astronomical observations, made with proper instruments placed on it, time-pieces may be regulated to a second: The uses to which this may be subservient are also too obvious to need comment.

I have been thus particular in describing the manner in which this meridian line has been drawn, in order that those who are less acquainted with it may thereby be directed to the proper method of doing it, and that those who are competent to it may examine the accuracy of the operation.

When these observations were made, the needle pointed 5° 44 minutes to the west of north. I shall only further observe, that observations on the ordinary variations of the needle, should be made early in the morning, as there is what is called a *daily variation*, which increases irregularly till the afterpart of

the day, and returns before next morning to its usual state. This irregular daily variation sometimes amounts to a quarter of a degree, and does not appear to be governed by any uniform law, but to be influenced by the casualties of greater or less degrees of heat, and probably by other fluctuating causes of which we are ignorant.

Receipt for sprouting or raising Quick or THORN PLANTS, *for making Thorn Fence or Hedges.*

By the Hon. GEORGE TIBBITS.

Read before the Society, April 18, 1818.

IN the fall, when the haw or thorn berries are ripe, collect them and lay them in a pile mixed with a small quantity of rich warm loam, in a place in the garden somewhat shaded by a fence or tree—About the middle of the succeeding summer turn them with a shovel so that the whole parcel may be equally exposed to air and frost; in the succeeding spring, when they will have been exposed to the frosts of two winters, and the air of one summer, and as early in it as the ground can be spaded up and raked fine, spread them with a shovel as evenly as may be over a bed or beds of rich loam land that shall have been kept clean of weeds, the summer previous, by cultivation with beets or any other garden vegetables. All the good seeds will directly sprout and grow. The beds are then to be kept clear of weeds and grass. Many of the plants will grow two feet the first year, and will be sufficiently large to set in hedges the next spring. The smaller sizes may be left standing in the beds or transplanted, and the next spring, or at the end of two years, they will all be large enough to plant in hedges.

This method answers equally well for the thorn of this state and the English white thorn.

From 1500 to 2000 plants will grow on a bed of 4 by 14 feet. As the seeds are not all good, or without meat, as it is called, the quantity sown should be large, and if they come up too thick they may be pulled up and thinned in weeding.

If the thorn of this state is made use of, as we have several kinds, and as some grow faster and larger than others, the large or long lobe leaf should be preferred, and the oval serrated leaf after that.

The haw or thorn berry of the Maryland thorn being much less than ours or the English white, 12 quarts to the bed is sufficient.

METHOD

Of Destroying the CANADA THISTLE.

By JAMES FERGUSON,

OF WESTERLO, ALBANY COUNTY.

Communicated by the President, May 1, 1818.

Mr. Ferguson states that the following method of destroying the Canada thistle has proved effectual; having tried it in Vermont.

When the thistle is in that state of maturity that the stalk is hollow, and which will be some time in August, choose a wet or lowering day and mow them down, not too close to the ground. The hollow parts will then become filled with water, from succeeding rains, which will kill the roots. The plants which are not arrived to that state must be cut down in the same manner the next year, and the same operation repeated the third year, which will probably complete the work. One man may mow two acres in a day.

OBSERVATIONS

On the Culture of POTATOES.

Communicated in a Letter to the President,

By CHRISTOPHER HUTTON, Esq.

OF KINDERHOOK.

Read before the Society, January 19, 1819.

SIR,

I take an opportunity to communicate to you, a method of cultivating the potatoe to great advantage.

For the sake of experiment let an acre of ground be selected, which however should not be either stony, gravelly or clayey. Manure the same, and then plough and harrow it. Let it be manured a second time, and plough and harrow as before. This process will mix the manure equally. A straight, deep furrow should then be drawn, into which the seed potatoes must be put, about a foot apart. Select the largest you have for this purpose. Then strike another furrow so near to the first as to cover the potatoes already planted, and in this, plant the second row, and so on through the whole acre. This will make it, as it were, a solid bed, not a stroke of labour or foot of ground is lost. Each seed stands about twelve inches apart, and if the potatoes be of a right size it will require about 150 or 200 bushels.

Next as to the manner of gathering them. Put in your plough deep, right on the line of your fruit, then take a wide toothed rake, draw out the largest for

your next year's seed, take these from the field.—Then use a second rake, toothed narrow, for taking out those which are suited for market or family use. A third one may be used, still smaller, for drawing out the refuse.

It will be found that it is not an exaggerated statement to assert, that from 1000 to 1500 bushels of potatoes may thus be obtained from one acre, and that with little or no labour as to weeds, and none as to hilling.

It will readily be perceived, that in pursuing the above directions, much time will be saved in gathering the potatoes. The plough loosens the ground and renders it extremely easy to pull up the vines.

When the ground is good and you have no spare manure, let a bundle of straw be taken under the arm, and strown lengthwise in the furrow, directly on the seed. This is found to be highly favorable to their growth. The same acre of ground, *if good*, will require in the second year nothing more than dunging, ploughing deep and harrowing, and with this dressing will answer two or three years; for there are instances where the same ground after being used in this way, for several successive years, became too rich for this culture and the crop had to be changed. It will easily be seen, that in furrowing the ground for planting, the plough and hoe should be carried round in course, and you should plant and plough on either hand—so also in gathering.

The teeth (either of wood or iron) of a potatoe rake ought to be a little larger than those of a com-

mon one. The head should not be long, with a short handle for quick motion. If the teeth are of iron, made round (and which indeed is almost indispensable) they may be somewhat crooked, so as to work the potatoes up to the surface.

There is perhaps nothing more improving to the growth and quality of potatoes, than the application of *straw* when planting them, and this, whatever be the mode pursued. Although potatoes will grow on any soil, yet there ought to be some care in the selection. There is perhaps no vegetable that partakes more of the nature of the earth on which it grows, than the one under consideration. In all cases where it is possible, let the ground selected be a small declivity facing the south. In this climate, potatoes for winter use ought not to be planted before the first of June.

OBSERVATIONS

On the Culture of WHEAT, *and the Manufacture of* FLOUR, *in the State of New-York.*

By JONAS HUMBERT,

OF NEW-YORK.

Read before the Society, January 25, 1819.

THE subject matter and design of this communication is respectfully submitted to the candid examination of the society, and if deemed worthy of notice, it will confer an honour on the writer. It is principally intended for those who raise grain, and with a view to induce them to adopt a proper method in procuring seed wheat from the main crop, in order that a constant supply of a superior quality may be had by our farmers, which mode, if adopted and generally introduced, will tend to improve the wheat harvests throughout our state in the course of a few years. In the close of this paper a few observations will be offered to your consideration, embracing the interests of some manufacturers of flour, who reside in several western counties, whose flour has often arrived for several years past in this market, in a spoiled condition : this particular was intimated in the first communication I had the honour to submit to your respectable institution.

Before I proceed, however, to my immediate design, I beg leave to adopt the language of the Hon. Richard Peters, President of the Philadelphia Agricultural Society, as applicable, in a good degree, on the present occasion—He says, " It is difficult, if not

impracticable, to produce conviction on the minds of the generality of farmers, that persons who have not been educated or manually employed in farming, can give much useful information in, or energies to agriculture. And yet the greatest improvements in husbandry, have been either suggested, or made by those who were not professional farmers. If pecuniary assistance should be required out of the public funds, it should be afforded. A CENT, expended with propriety, to aid and reward genius and industry, in pursuing agricultural experiments and researches, will add an EAGLE to the public stock. This is applying nourishment to the public prosperity."

"Were it without example, it would be surprising that legislators, consisting for the most part of farmers, have done so little for the encouragement of a profession, which is calculated, above all others, to produce additions to the common mass of property, by creating countless supplies, drawn from the earth."

"In England the establishment of a board of agriculture, under the patronage and pecuniary encouragement of the legislature, is recent, but its advantages are incalculable."

"In France, agriculture is accounted as it really is in all countries, the basis of public and private wealth and prosperity. Its patronage and encouragement are placed among the first objects of public attention, and radically interwoven with the principles and system of their national policy and government. Perhaps the period is not distant when

the public mind here will be turned to this subject. Nothing will then be wanting towards the accomplishment of every thing wished for, by the friends of this important and valuable art. They have received the highest gratification, and must conceive the strongest hopes, by observing this subject recommended to the legislature," by his excellency, "who has constantly mingled with his other patriotic solicitudes, an unabating desire to forward agricultural enquiry and improvement." Such is the language of this eminent man.

In the whole list of agricultural products, perhaps there is none of more value to our state than the grain of wheat. It is a crop as certain, and cultivated as easily, as little expensive, and produces generally as high a price, as any other article raised from the ground. For home consumption and for foreign markets, it affords the farmer at all times a ready means to obtain cash, and promises him a rational prospect of acquiring, in a short period, a moderate competency. Whatever he may find necessary to advance his agricultural pursuits, or for the use of his family, he can at all times command, if he has been careful to raise this useful grain.

It is much to be regretted, that there has of late years existed too great a degree of inattention among many farmers in cultivating this plant, so useful in society: as well as great negligence in its preservation after it has been thrashed, and an unpardonable carelessness in those who purchase and store up large quantities of it. There is not a district in all Europe or in Barbary in which wheat is cultivated

and stored, where they is so little attention paid as among our large wheat dealers, in cleansing and ventilating grain. This subject is of serious concern. Such negligence is fraught with many bad consequences, and calls aloud for some alteration. When grain lies in large heaps and is not ventilated frequently soon after harvest and threshed, *must* takes place ; and in warm and humid seasons it becomes highly putrecent if suffered to be so kept, and diffuses into the body of the grain a deleterious power, extremely detrimental to health. When in such a condition, it is a nursery for millions of the insect tribe, and is often very improper to be used for future crops. Besides, flour made of such grain cannot be considered as proper for aliment at home : and as an article of commerce, it must tend to injure our reputation, unless it is shipped as an injured commodity ; and this ought to be avoided as much as possible, because it seems to implicate our character and knowledge, as well as to indicate a want of close attention in agricultural pursuits : and eventually, must lead foreigners to suppose there may be some characteristic defect in our wheat, or that we are ignorant of the proper method of manufacturing it, so that it shall keep sound and sweet.

Societies established for the promotion of useful arts, and particularly those which take an immediate interest in advancing agricultural concerns, may render important benefits to individual farmers, as well as to the whole state, by encouraging experiments tending not only to increase the abundance, but also to promote the perfection of all our crops,

especially those of the highest value, and which constitute a large portion of our food.

This subject cannot be too strongly impressed on the minds of those sincerely devoted to the prosperity of the state of New-York. Under the auspices of a chief magistrate, whose mind is cultivated in every branch of useful knowledge, and who is exerting the powers of his genius and sound understanding, in laying the solid foundation of agriculture, manufactures, arts and sciences, (the basis of our prosperity and grandeur,) what may we not expect if we pursue a rational course of enquiry, combined with experiments which shall augment our abundance, and at the same time advance the perfection of our harvests?

There is no doubt but that too many cultivators of grain in our state, are very remiss in several particulars which concern the cleanliness and perfection of their wheat crops; and this is the more to be regretted, as it will require time and a considerable portion of labour, repeated advice and admonitions, before we may expect to see all that beauty, cleanliness and excellence so desirable in this culmiferous product of our state. Every laudable means ought to be used to stimulate and urge our farmers to an exertion, the hope of a more certain and permanent prospect of enhancing the value and superiority of their wheat crops and other products. It is true, eager, grasping speculation, has falsely disclosed an enchanted field of gold near at hand, instead of following a more rational, just and steady course in the pursuit of wealth, from high prices for superior

commodities. The foreign demands for several years have been great with but little intermission: This has occasioned much negligence, because good or bad, foul or clean, sweet or impregnated with *must*, both wheat or flour, commanded a high price and sold rapidly. This cannot be expected to continue long; and how our moral or commercial character is, or may be hereafter affected, is a subject worthy of some consideration. Nations in such cases, act like individuals, and will turn their views to other people to be supplied with good, cheap, clean grain and sweet flour: and when such a direction once takes place, we may feel the consequences. When the trade of a people is lost, and turned in favor of another nation, who will supply their customers with sound, wholesome articles, it will be found very difficult to regain their custom. Commercial confidence is always to be sought and courted, but never to be trifled with, by those who value steady commerce and prosperity. A few more years of peace on the old continent will demonstrate the truth of these remarks. Enterprise in agricultural pursuits, is encouraged in every part of Europe, and seems, from a consideration of its importance, to be the order of the day, in England, France, Russia, Prussia, Sweden and Denmark. Although this may be the business of a statesman, and the duty of a wise legislature to keep an eye upon objects so important, yet a great deal can be accomplished by the united efforts of this Society, and those others expressly organized for the advancement of agriculture, by exciting a spirit of enquiry and enter-

prise amongst our farmers, that shall, in a short time, produce a greater abundance of clean, rich wheat, to be sent to this market.

That the evil intimated ought to be corrected in some way, will not be disputed by any one who has seen the slovenly condition of a great deal of the grain coming down the Hudson to this city. What is the surest method to effect a change for the better, is a question of considerable import; and I shall not so far impose upon myself as to believe, that the only and most effectual remedy is to be found in this communication. Let investigation fairly be set on foot, by individuals or societies, and the great object will be answered, and he who shall advance the most reasonable and effectual plan to improve our grain and flour, will no doubt be entitled to suitable applause. Satisfied in my own mind that great inattention has taken place, I cannot but express a wish to see this highly valuable grain brought to this market in a superior condition to what it has been for some years past. And I beg leave to suggest to the notice of your Society the propriety of discontinuing the raising, of what is called "Summer Wheat," until enquiries may be instituted, by a board of agriculture, or your valuable institution, how or in what way such grain may be improved, if raised at all, by our farmers. I am very much inclined to believe, from strong analogous reasoning and example, that this subject merits investigation. One bushel of this kind of wheat is generally sufficient to impart a dark shade to the flour made from five bushels of the best grain. It is only proper for flour of second quality, and fine

and common middlings—and it would be well if our wheat dealers would keep such wheat separate from good winter grain, and send it to market to be sold by its proper title. This wheat does not possess the oleaginous properties in equal portion with winter grain. If it could be improved by a different mode of culture, or from sowing varieties either raised in this state, or imported from Sicily, Egypt, Aleppo, or some parts of the coast of Barbary, or Spain, great advantages would doubtless ensue.

From an examination into the tendency of the drill husbandry, as practised by the most skilful and best experienced in England, and by some American farmers, I have ventured to offer for the consideration of the Society, the following method of raising seed wheat, with a view to attempt the improving of the wheat crops in our state : it is as follows—Let two acres of good ground be selected and ploughed well and harrowed, so as to bring it to a fine tilth, resembling a garden spot well raked : and in the first instance, have an acre laid out in rows or trenches about 8 inches wide to receive the seed after it is well prepared : let the rows be separated by rows or trenches 18 or 20 inches each—the rows to receive the seed about 2 inches deep, and when the seed is sowing in them, have the grains apart as equally as convenient, and considerably thinner than the other acre to be sowed in the usual broad cast method: let the seed be covered as speedily as possible with fine earth about 1 1-2 or two inches, with stakes at each end of such rows, and these rows should be in straight lines. 2. Take sound wheat of the best ear-

ly ripened, either one or two years old, that has been kept cool, as free from rye, chess, cockle and smut-balls as possible: let the grain be submerged in blood-warm water, well stirred, and then remain unmoved about twenty minutes or half an hour; the foul grains, smut balls, and other impurities will rise to the surface; these having been taken away, let the grain be scowered well in clean water, heated so as to be convenient to the bare hand; this operation will kill insects and destroy their eggs if any should be attached to the plume, or downy part of the wheat: a little river sand, or any fine sand or gravel used in scowering, with good stiff hair brushes, will render the grain perfectly clean in a few minutes: let the water be changed, and the wheat again stirred in it. 3d. Take this clean seed and spread it on a floor to dry, and sprinkle a small quantity of fresh, slacked lime and ashes mixed together; when dry, sow the seed, or if time will allow, plant the grains. Some excellent farmers steep their seed in salt pickle, river water, lye, or fresh water, and give as a reason for such treatment, that it hastens vegetation, and the crop is not so subject to smut. Mr. John Spurries, Humphrey Marshall and others, attest to this fact. 4th. Let such rows have their termination on the lowest end of the ground laid out: this carries off any superabundance of water; and in the spring as soon as the frost is out of the ground, hoe the intervals and pulverise the earth to a depth of ten inches, and as near the young plants as may appear prudent. 5th. When the plants begin to spindle let some fine earth be hoed towards them; and when

the blossoms appear, take off about as much earth from them, and as soon as the blossoms are completed, let the ground be made fine again, and placed well up to the roots, somewhat inclining to the stalk. This last operation is said, by the best informed in drill husbandry, to increase the number of grains—to fill them better than when the seed is sown broad cast, and also to lengthen the ears considerably. 6th. During these several periods, let the weeds and rye be carefully taken up and carried away; these do vast injury to the plants by depriving them of nutriment, are a harbour for insects, and when in a state of decay, as well as otherwise, diffuse an effluvia through the grain very injurious to its growth and perfection. The acre, sown broad cast, should have two or three paths for the purpose of weeding it as much as can be done conveniently.

Should this mode of trial be put in practice under the sanction of your respectable Society, or any agricultural association, it is probable the most incredulous will be convinced how much benefit this valuable plant, as well as many others, derives from *light*, *heat* and *air*, independent of the benefits obtained from the earth being finely pulverised, which in such a state imbibes much from those powers, as well as from rain and dews. In such a fine, loose state, moisture derived from the dews, penetrates every particle of earth, opens the pores for the finest or smallest roots and fibres, so that they extend greatly in search of nutriment. Hence it will appear plain to the understanding, that plants so situated cannot fail of deriving double or treble advantages, from a

free circulation of pure air, and the genial influences of the sun, above those which spring from seed sowed broad cast. And however well the other acre may appear, sowed broad cast, this particular method will show the wheat to be heavier, to abound more in gluten, and to possess a larger portion of rich volatile oil. It is this property that gives wheat its fine flavour, so agreeable to the taste. From several strong circumstances, and repeated trials, I am induced to conclude, that the wheat of this state generally abounds more with this delicate oil, than the grain south of Pennsylvania and Delaware, excepting some parts of Maryland, and particularly the wheat from the Eastern Shore, which is exceedingly fine grain. The method now recommended to raise a constant stock of superior seed wheat, is attended with more labour than the ordinary way, but the advantages will more than balance such extra labour.

The discernment of the Society will no doubt lead them to estimate and determine on the merits of these particulars. And, though I am not at all disposed to indulge in vanity, yet I hope they will perceive a few hints which may be improved by agriculturalists who take pleasure in exercising their reason when cultivating their fields. As it is a common sentiment that changing seed is beneficial, if the plan here proposed should answer, there soon will be found a large supply of a superior quality.—Those who state the fact, that the same grain deteriorates, if continued to be sown on the same land for a long time, do not assign any satisfactory reason why this is the case, at least nothing conclusive, has as

yet fallen under my observation. This is perhaps the business of natural philosophy, and until we come at the real cause, the remedy must rest in conjecture, and the trouble as well as inconvenience of changing seed from one farm to another be continued.

Before I proceed to offer a few remarks on the spoiled condition of a great portion of western flour, that every year arrives in this city, permit me to ask you, gentlemen, what can be the real cause why "Albany wheat," so called by our flour dealers, should be so much tinged with a bluish cast, when manufactured into flour? To you it must be considered a question of interest. I am not in possession of information how far this matter has been considered by the Society; nor do I know that the subject has been investigated by any individual with a view to remedy the evil. Is it not to be feared that there is great negligence in selecting proper seed by the farmers of your county? It is irrational to suppose that foul and injured grain can produce a crop of clean handsome wheat. Spurrier, an eminent farmer, says, (on the authority of long practice in England, as well as in the state of Delaware) "there is a great advantage in keeping grain clear of weeds, which is,—that it is not so liable to blight, or to take the smut, as when it is full of weeds, as I have frequently observed; for cleanliness is as essential to the well doing and growth of vegetables as of animals." Complaints are frequent about this wheat being smutty, light and foul. Surely, these unfavorable circumstances can be removed?

In a volume published under the direction of the secretary of the London society, for the promotion of agriculture, some twenty years since, I observed that chalk had been used in the county of Hertfordshire with great advantage in a compost manure, as it completely changed the bluish cast of the flour made from the old wheat of that county into the most beautiful white colour, and it is now considered the handsomest in that kingdom for pastry: how much chalk was used on an acre, or how long, was not stated, but the fact is emphatically asserted. This practice is pretty general with the English farmers, and they boast that their "wheat makes the finest and whitest flour in all Europe." But about twenty years ago several questions were proposed to the bakers of the city of London, by a respectable board acting under authority, concerning English and American flour: the answers given were—that American flour was superior. Cannot your Society induce a few farmers in the county to make trial of some chalk on a few acres, to ascertain whether any change would be effected in the course of one, two or three years? The result, if favorable, will be of vast advantage to our farmers, by removing the complaint, and giving to the flour a superior colour, as well as to the grain itself advantages for exportation. Under existing circumstances it is respectfully submitted to your consideration, whether some remedy ought not to be recommended to the cultivators of your county. The learned Humphrey Davy, in his Agricultural Chemistry, says, the uncertainty of success is far from proving the inutility of trials;

one happy result which can generally improve the methods of agriculture, is worth the labour of a whole life; and an unsuccessful experiment, well observed, must establish some truth or tend to remove some prejudice." This language is too forcible and conclusive to be mistaken; it requires only to be read with ordinary attention to produce conviction.

Since my first communication to your honourable institution I have seen considerable quantities of western flour come to this city: some just on the point of spoiling; other portions quite heated; some musty; others sour, and getting hard. This has been the case for many years back; the loss is from six to ten, and sometimes sixteen shillings per barrel. No remedy has ever been given in a public way, by any one holding the responsible office of flour inspector; the cause is not for me to develope. It is true the law does not require this of the officer; but a regard for the interests of the state, ought to stimulate him to prevent such sacrifices, by timely and judicious directions.

If our millers in the western district, as well as others, wish to keep their flour good and sweet, and to be shipped to a foreign port, a different practice is necessary from what is but too customary. At present in most mills, even in hot weather, from 12 to 20 hours is all the time allowed from grinding the grain to commencing the packing of the flour; and little or no attention is paid to the humid or arid state of the wheat, or to the weather; this is a very incorreet mode. In the *first* place, I would sug-

gest the propriety of shifting and ventilating all wheat, but particularly that from wet, heavy clay soil, which requires more attention than that from a loam or sandy soil. *Secondly*, screen as frequently as convenient, and take care to exclude rye, all foul grains, and smut balls: if these are numerous, and difficult to separate, submerge your wheat; they will swim on the surface of the water. *Thirdly*, keep the damp wheat by itself, so that when it is ground, you may place it before bolting, on a floor to be shifted once or twice a day for the space of 4, 6 or 10 days: in dry weather, one stirring a day will answer, in damp, twice, with closed outside shutters. *Fourthly*, let all grain be ground as *cool* as possible, and keep the mill-stones as even by a straight edge as can be, and picked so as to have the wheat *cut* as perfectly as the nature of the grain will admit; when the mill-stones run continually for a long time, some parts are apt to be worn smooth, and the grain from such circumstances is injured, not being properly cut, but mashed and burned by reason of the intense heat of the mill-stones coming in too close contact. Attention to these outlines will be sufficient to prevent this article from perishing so soon as it has for years past, and if put up in dry barrels, and kept from damp, it may be expected to remain good at least one year, and may be sent to any port in Europe with confidence, provided no Indian corn flour, or old musty flour is mixed with it. Every kind of extraneous substance is detrimental to the sweetness and preservation of this commodity. The cost of such extra trouble will not average more than one

shilling per barrel, perhaps not more than 8 cents. —The advantage to our western millers ought to incline them to adopt this mode in manufacturing, as they lose so much on their flour, made in the hurry attendant on Evans' plan of grinding, bolting, and packing all in a few hours. In England, France, Germany and Poland, where wheat is constantly ventilated, and kept sometimes for many years after such treatment, they do not grind and pack up, or down if you please, in so short a period as our millers, whose grain is not half as dry. It is not my province to lay down any thing like a scale, stating what portion of superfine, fine flour, fine or common middlings ought to be made from one hundred bushels of good wheat; this belongs to the general inspector, and is a duty, amongst many others, he owes to the manufacturers of our state.

As large quantities of superior wheat are raised in several western counties, those millers can send to this market, flour equal to any in the United States, or from any part of the world. Their wheat is beautiful; the goodness of their flour is known by its *whiteness* and *weight*; and when the manufacturer does *justice* in grinding and dressing, it affords a rich highly flavoured bread, and retains its sweetness and moisture for a long time. The best Virginia flour when baked with skill, (except that from May wheat baked when new,) quickly dries and crumbles when cut, after their wheat is 6 or 9 months old; our flour, on the contrary, is improved from the age of our grain, if it be kept cool and dry.

From long experience in the article of flour, (having used English, French and Irish, as well as a great deal from several states in the union,) allow me the liberty, gentlemen, to say, that I am well satisfied our state is capable of supporting a reputation as high, for wheat and flour, as any other state, whatever competition may hereafter take place. Should this paper meet the approbation of your Society, and correspond with their views, and contribute in the slightest degree to prompt investigation and the improvement of our wheat crops, it will afford much pleasure to the writer; and as far as his limited information and talents shall enable him, he will consider it a duty, and esteem it a pleasure, to suggest such improvements as may appear to him to be reasonable, and calculated to advance the agricultural as well as the commercial interest of our state.

MEMOIR ON ALUM.

By T. ROMEYN BECK, M. D.

Read before the Society, February 1, and March 1, 1819.

THE object of the present paper is to offer to the Society, a view of one of the most important of the chemical arts. In preparing it, I have consulted every work relating to the subject within my reach, and have aimed, rather to arrange and concentrate the information thus obtained, than to suggest new views either in the theory or practice of the art.

Had the work conducted some years ago by Professor Cooper of Philadelphia, under the title of the EMPORIUM OF ARTS, been continued, this attempt would doubtless have been useless, as the subject under consideration was one of those which he proposed to notice. I venture, though with unequal steps, to examine the history, progress and present state of the manufacture of ALUM, with a hope that my investigations may prove useful to some, who are unable to consult systematical works, and above all that they may direct the attention of our citizens, to the means which they possess within their own reach, of converting useless mineral products into rich sources of individual and national profit.

I propose noticing the mineral called ALUM, under the following divisions: 1. Its history. 2. An account of the substances from which it is obtained, and a notice of the places where they are found. 3.

The composition of alum and the manner in which it is manufactured. 4. The comparative value and purity of the various kinds of alum; and 5. Its uses in the arts. I shall conclude with such notices of the localities of the minerals from which it is obtained, and of its manufacture in this country, as I have been enabled to obtain.

1. ITS HISTORY.

A substance named *Alumen*, was known to the Greeks and Romans, and was employed by them in dyeing and in medicine. A question has however arisen, whether this was the mineral known by the same name at the present day. Professor Beckmann of Gottingen, in his highly interesting work entitled "*A History of Inventions and Discoveries*," is of opinion that the alumen of the ancients was vitriol, or, an impure sulphate of iron or copper. He endeavors to establish this assertion, by referring to their ignorance of the nature of salts and of mineralogy in general—to the fact of the Greeks and Romans never speaking of any other than natural alum, when it is a well established fact that this salt is seldom produced spontaneously—and lastly, to the circumstance, that "the smallest traces of alum works are not to be "found among the ancients, nor even of works for "making vitriol, except what is mentioned by Pliny, "who tells us that blue vitriol was made in Spain, "by the process of boiling, and this circumstance he "considers as the only one of its kind, and so sin-"gular, that he (Pliny) is of opinion no other salt

"could be obtained in the same manner."* This is the prevailing opinion of the present day, and the authority of Beckmann is quoted by the most esteemed writers.†

Dr. Bancroft the author of a very valuable work on dyeing, has however controverted several of these opinions; and a quotation which he gives from Pliny is entitled to very decisive weight. This author (chap. 15. book 35) observes "that there are many "kinds of alum, that of these, the island of Cyprus, "affords two, one *white* and the other *black*, and "that, though their colours do not differ so much, "*their uses are very opposite*, the white alum be-"ing of the greatest utility for dyeing upon wool, "clear and light or bright colours, as on the contra-"ry, the black is, for dying brown and black co-"lours." Pliny also adds, that they were all obtained by natural exudations from the earth, in Spain, Egypt, Armenia, Pontus, Macedonia and Africa, and in the islands of Sardinia, Melos, Lipara and Strongyle‡ and afterwards enumerates five several sorts of alum. Now, it is highly probable, that some of these may have been vitriolic salts, of a metallic nature, but it is certainly equally probable, that he has included among them a sulphate of alumine; and this is rendered very probable from the observation of Dr. Bancroft, who remarks, that as the ancients long before the time of Pliny, were able to dye scarlet from the *Kermes*, they must have possessed alum in some degree of purity, since they were wholly ig-

* Beckmann's History of inventions and discoveries. Vol. 1st. p. 289.
† Jameson, Thomson, &c. ‡ Now called Stromboli.

norant of the use of tin, the only other basis, by which the colour in question could have been produced.*

It is a fashionable opinion with many learned men of the present day, that India was the country whence Egypt drew its knowledge, and consequently, that it was the most ancient civilized state. Whether this be correct or not, it is sufficient for our present purpose to state, that a constant intercourse was maintained between these countries, and as a natural consequence, the arts of one were introduced into the other. In India, the arts of dyeing and calico printing were in common use, when the Portuguese first visited that country, and the use of alum was of so ancient a date that no means existed of ascertaining when it was first introduced.‡ So also in Egypt, we have the authority of Pliny, for stating, that the same arts were practised. It is hence, I conceive, not improbable, that alum, in the modern acceptation of the term, although probably not in so pure a state, was known to the ancients.

The alum of the ancients appears to have been procured in large quantities by them from Egypt. Herodotus informs us, that when the people of Delphos, after losing their temple by fire, were collecting a contribution in order to rebuild it, Amasis, king of Egypt, sent them a thousand talents of alum. Even at the present day, it is said to be one of the

* Bancroft on Colours. Amer. edit. Introduction, pages 16, 17, 18. Dr. Bancroft adds the following remark: "Indeed the kermes would have "afforded nothing but a black dye, with any preparation of iron, and "nothing better than a dark brown with any preparation of copper."

‡ Bancroft, Introduction, page 20.

exports of Egypt, but it is remarkable that there is no author who mentions where it is found or made, or who has described the method of preparing it. I state this on the authority of Beckmann,† and it may be added, that although the French expedition took place after he wrote, yet not a word concerning this substance is to be found in the memoirs of the Institute of Egypt, although they notice several other dyeing drugs.

Of the other places enumerated by Pliny, it may be observed that Sardinia, Macedonia, Spain, and the island of Melos (Milo) still produce Alum.—Lipari formerly contained so large a quantity of this substance, that the duty on it brought a considerable revenue to the Romans, and at one period, it even carried on an exclusive trade in this article, but at the present time, there are neither vitriol, nor alum works in this island.

The alum now in use throughout the world, was first made and introduced into notice in the East. In the fifteenth century, there were alum works in the neighbourhood of Constantinople, and the Italians procured the article along with other materials for dyeing, from the Levant. It is mentioned by several historians, that the Europeans who first made alum in Italy, learned their art at Rocca in Syria, a place not to be found either in books of geography or charts. And it is supposed, with a great show of probability, by Beckmann, that Edessa was meant, since it has sometimes been called by a similar name. "This much "at least, is certain, that minerals which indicate

† Vol. 1, p. 291.

"alum, have been often observed by travellers in "its neighbourhood." This notice of that place derives additional interest from the circumstance, of the alum of modern times deriving its name from it —being called *Roch Alum* by the English, and *Alum de Roche* by the French.†

Another alum work, no less celebrated in the 15th century, was established near Smyrna. Ducas, one of the Byzantine historians, relates minutely in what manner the article was made. There was a mountain at Phocis, that abounded in aluminous mineral. The stones found on its top were first calcined in the fire and then reduced to sand by being thrown into water. The water mixed with that sand was put into a kettle, and a little more water being added to it, and the whole having been made to boil, the sand liquefied and the thick part which falls to the bottom in a cake was preserved. The cake was afterwards suffered to dissolve in vessels for four days, at the end of which, alum was found in crystals around their edges, and the bottoms of them also were covered with pieces and fragments of the same nature. The remaining liquor which at the end of four days did not coagulate or harden, was poured into a kettle, more water and more sand was added to it, and being boiled as before, it was put into proper vessels; and the alum obtained in this manner, he observes, is preserved as an article very necessary for dyers. All masters of ships (he adds) bound from the Levant to Europe, consider alum as a very convenient

† Beckmann—Vol. 1. p. 298, 299. Bergman's Chemical Essays. vol. 1, p. 339.

and useful lading for vessels. These alum works were leased, in the reign of Michael Palæologus, to Italians, who sold the produce of it to their own countrymen, and to the Dutch, French, Spaniards, English, Arabs, Egyptians, and the people of Syria.†

The oldest alum works in Europe were established about the middle of the fifteenth century, but it cannot with certainty be ascertained where they were *first* erected, since it appears that several were set on foot in different places at the same period.—By some, it is affirmed that Bartholomew Perdix or Pernix, a Genoese merchant, was the earliest manufacturer. He is said to have been much attached to the study of natural history, travelled often through Syria, and learned at Rocca the method of boiling alum.—Some years after, he passed the island of Ischia, (which is near Naples) and which had been recently visited by an eruption of a volcano. Among the rocks thrown up near the sea coast, he observed several that were of an aluminous nature. He applied the skill he had acquired in Syria, and by calcining them, procured most excellent alum. This was about the year 1459.

Another work of great note, and to which I shall hereafter advert, is that, situated in the territories of the Church in Italy, about an Italian mile north west from Tolfa and six miles from Civita Vecchia. The founder of it was John De Castro, also a trader to the east, and who had an opportunity, while trafficking at Constantinople, of learning the method of

† This work has been long since abandoned, although alum made in the neighbourhood of Smyrna is still exported.

boiling alum. He was in that city, when it fell into the hands of the Turks, and after that unfortunate event, by which he lost all his property, he returned to his own country. Pursuing there his researches in natural history, he found in the neighbourhood of Tolfa, a plant, which he had observed growing in great abundance in the aluminous districts of Asia, —and from this he conjectured that the earth his native soil might also contain the same salt, and he was confirmed in this opinion by its astringent taste.† Holding at this time, an office in the apostolic chamber, he announced the circumstance with the true enthusiasm of a discoverer to the pope. "I "announce (says he) to you a victory over the Turk. "He draws yearly from the christians above 300,000 "pieces of gold, paid to him for the alum with "which we dye wool several colours, because none "is found here, &c. I have however found seven hills, "so abundant in it, that they would almost be suffi-"cient to supply seven worlds." The pontiff was too wise to neglect so beneficial a discovery—he employed Genoese who had themselves worked in the Turkish mines, and they declared it similar to the Asiatic mountains which produce alum. The pope (Pius II.) has himself condescended to be the historian of this discovery, and he adds, that when it was satisfactorily ascertained, they "kneeled down three "times, worshipping God, and praising his kind-

† "The plant was the Ilex aquifolium, which is still considered in Italy as an indication that the regions where it grows abound with that salt; but it is no less certain that the shrub is found where there is not the least trace of alum; and again, it is not to be seen in several places, where the soil abounds with it." Beckmann, vol. 1. p. 311.

"ness in conferring so valuable a gift on our age." To the discoverer, a statue was erected by Pius, and he received, what must have proved an additional source of satisfaction, a certain share of the profit. It was manufactured in large quantities, and sold to the Venetians, Florentines and Genoese.* The period at which this discovery was made is not certainly established, but it was somewhere between 1460 and 1465—and Tolfa, at the present day, still furnishes a large share of the alum used in commerce.

A third alum work of early date, is said to have been erected at Volterra in the district of Pisa, in 1458, by a Genoese named Antonius. Indeed the great revenue derived by the apostolic chamber from the Tolfa works soon induced many to search for aluminous minerals, and works were erected wherever they were found. The pope, however never desisted, until he had caused all the works erected in the territories of others, to be given up, and secured to himself the monopoly of the article. He then endeavoured to prevent foreigners from acquiring a knowledge of the art, and at the same time, by his commercial treaties, greatly extended the sale. The price was raised from time to time, and it became so high that foreigners could purchase it cheaper from the Spaniards or even from the Turks.—His holiness became alarmed at this last circumstance, and he issued prohibitions and threats against any who should purchase alum from the infidels.

* The pope employed more than 800 persons at Tolfa in preparing it.

In the year 1468, pope Paul II, entered into a commercial treaty respecting alum with Charles the Bold, duke of Burgundy; but in 1504, Roman alum had risen to so exorbitant a price, that Philip the Fair, archduke of Austria, caused a council of enquiry to be held at Bruges, by which it appeared that this article could be purchased at a much cheaper rate in Turkey. Commissions were therefore sent thither for that purpose, but scarcely was this known at Rome, when a prohibition, under pain of excommunication, was issued by pope Julius II. Nor was he the only one who promulgated the anathemas of the church, against such purchasers, since Paul III, Paul IV, Gregory XII, and others, issued similar edicts.

These means, however, had only a temporary effect. Alum works were soon erected in other parts of Europe, and the first out of Italy was one in Spain, at Almacaron, not far from Carthagena. This still subsists. In 1554, alum began to be made at Oberkaufungen in Hesse, and in 1558, letters patent were granted for the works at Commotau, in Bohemia. Of the numerous alum works, that were in existence in Germany, during the 16th century, there is one still remaining, viz. that of Schwemsel in Misnia.

In England, the first alum work was erected at Gisborough, in Yorkshire, in 1607 or 1608, by Sir Thomas Chaloner.† Having an estate there, he conjectured from the nature of the plants which grew

† Cambden's Brittania.

wild, that there must be minerals in the neighbourhood, and after making some search at length discovered alum. As there was, however, no one who understood the method of preparing it, he privately engaged workmen belonging to the pope's alum works, and it is said, that as soon as the pontiff heard of this, he endeavoured to recal them by threats and anathemas. This however had no effect, and the work soon succeeded so well, that more of the same kind were soon established. Here too, however, the spirit of monopoly, again broke out, and king James, after appropriating the work to himself prohibited the importation of foreign alum.*

The most ancient alum work in Sweden was established at Andrarus in Scania, in 1637. The number gradually increased, and in 1767, when Bergman published his dissertation, there were seven.†

The above sketch contains all the information I have been enabled to obtain concerning the commencement of this art in various European countries. It is not necessary, to continue the enumeration to a later period,‡ as works have become very numerous, and flourish or decay, according to the facility of obtaining the proper mineral, and the expence attending the manufacture of it.

One observation may be made at the conclusion of

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* To prevent the too frequent repetition of references, I mention here, that most of the above facts are obtained from Beckmann.

† Bergman's Chemical Essays, vol. 1. p. 341.

‡ There is an account of the alum works in England, in 1678, contained in the Philosophical Transactions. See the abridgment by Drs. Hutton, Shaw and Pearson, v. 2. p. 453.

this section. Indeed it seems to flow from a review of the narrative now given. This art was no sooner introduced in succession into various countries of Europe, than the respective sovereigns who engrossed its manufacture, endeavored to monopolize the advantages to be derived from it. The anathemas of the church, and the threats of corporal penalties were hurled on those who presumed to investigate the processeses of the art, or to improve the bounties of nature. How vain have these efforts proved, and how futile must be the effects of similar monopolies at the present day, if science and ingenuity are only directed to a discovery of the secret.

2. NOTICE OF THE SUBSTANCES FROM WHICH ALUM IS OBTAINED.

It will form a proper introduction to this part of our subject, to notice in a brief manner, the mineralogical history of this substance. The alum of *commerce*, is rarely, if ever, a natural production, but is manufactured from minerals that contain it, or is procured by chemical processes, which will hereafter be described. "It has even been doubted whether alum is ever a natural production, since it is enveloped in so singular a manner in the mineral substances which contain it, or from which it is procured or produced. From several of these, however, it is obtained merely by their exposure to the operation of the atmosphere on them, and in volcanic countries, it is largely met with, encrusting lavas." It has hence certainly as much

right, as many other substances, to be considered a distinct mineral, and accordingly we find it so arranged in most systematic works. The following is the division by Jameson, of the salts of alumina, (the basis of alum.) Species 1, *alum*. Species 2, *rock butter*. The first is sometimes called plumose alum, and it generally occurs as an efflorescence in aluminous minerals.* Thus it is found in this state, on the surface of bituminous shale and slate clay, at Hurlet near Paisley in Scotland, also encrusting alum slate near Moffat in Dumfrieshire, and at Whitby in Yorkshire. On the continent of Europe, it is met with in many places, as in the alum slate rocks near Christiana in Norway, in coal mines in Bohemia, on bituminous schistus at Gottwig in Austria and on grey argillite in Carinthia.

As a volcanic production, it is found at the Solfatara, a few miles from Naples. This is a small plain at the top of a hill, covered with a white soil and exhaling sulphureous vapours, which during the night emit a pale blue lambent flame. The ground even at the surface is considerably warm, proceeding no doubt from subterraneous fire. The white clayey soil of this plain, being constantly penetrated by these vapours, and the exhalations during the night, being for the most part mixed with the dew, and thus returned upon the surfac, cause it to be covered with a slight saline efflorescence, and this

* Phillip's Mineralogy. *Article* Alum.

"Alum is rarely found massive, that which is met with in the island of Milo, most nearly approaches to this character. If taken away, it shortly appears again, whence it is supposed to be merely close aggregations of efflorescence." Phillips.

efflorescence is alum, ready formed, which requires only purification in order to fit it for use. Alum is also a volcanic product in the islands of Stromboli and Milo in the Mediterranean, and in several other parts of Italy. The second species, the *rock or mountain butter*, is hardly worth attention, except in a mineralogical point of view. It is composed of alum mixed with alumina and oxide of iron.

Having thus stated that the alum of commerce is obtained, first, from what is called by mineralogists *native or plumose* alum, we add, that a second species from which it is procured is *alum stone*.—The colour of this substance is generally a greyish or yellowish white, and it occurs massive, and in veins running through argillaceous rocks at Tolfa (about which we have already spoken) near Civita Vecchia in the dominions of the church. Sometimes it is seen in nests and kidneys and is penetrated by veins of quartz. Alum stone is also found in various places in Upper Hungary. Here it occurs in beds, and pyrites, native sulphur and quartz are often found dispersed through it. These are the only localities of this mineral, if we except the one mentioned in the note.† It is from the alum stone of La Tolfa, that the *Roman alum* of commerce is made.

A third mineral from which this substance is procured, is *alum slate* or *aluminous schistus*.—There are two varieties of it. The *common* A. S. and the *glossy* or *shining* A. S. The lustre of the

† "A similar kind of ore has been discovered in rocks at Poliniere in Brittany." Rees' Cyclopedia. Art. *Alum*.

last is more of a metallic nature than that of the first. Both varieties are found in Norway, at Whitby in England and at Freyberg in Saxony. Esmark observed a vein of alum slate about two fathoms wide at Telkobanya in Hungary.* This mineral is also found in Saxony, Bohemia, Scotland, and some parts of France. It commonly occurs in the vicinity of coal, and it seems to differ in no respect from bituminous shale, impregnated with pyrites.† The alum of Great Britain and the north of Europe, is almost entirely made of it, for which use, the second variety is said to be the best adapted.

Alum earth is the fourth mineral used for the above purpose. This is of a blackish brown colour, has a strong resemblance to bituminized wood, and when left exposed to a moist atmosphere, becomes warm and occasionally takes fire. Hence, it has sometimes been used for fuel. Alum earth occurs frequently in beds of large magnitude in alluvial land, and sometimes also in the floetz trap formation. It is found in Bohemia, Saxony, Austria, Naples, Hungary, and in the Vivarrais in France—and in all these places is employed in the manufacture of alum.

The above minerals are those from which the *alum* of commerce is principally procured. Pyritous and pyrito-bituminous matters are however often found to afford vitriolic salts, by the combined action of heat and moisture. Hence it is that the upper strata of the softer aluminous, schistus, of the alum earth, and the sulphureous peats are often im-

* Jameson, Vol. 1. p. 433.
† Rees' Cyclopedia.

pregnated with alum. The marshy black soil of Arragon, that yields pure alum by lixiviation is supposed by a writer in Rees' Cyclopedia, to be of the latter class—also the aluminous turf of Helsingburg in Scania,† and a vein of black earth in the Shetland islands, containing alum and sulphated iron. The history of the first of these, viz: the black soil of Arragon, is somewhat interesting, as it adds another proof to the many already existing, of the inactivity and negligence that exist in Spain concerning its national products. *Dillon*, in his travels through Spain, states that the people of the country content themselves with digging it out of the earth and selling it to the French in its primitive state, who refine it, and then send it back to the Spaniards to be sold at a considerable profit. He adds, that this alum is entirely free from all foreign matter, and requires only to be cleansed from casual impurities.* It may also be added, that alum is extracted from fossil wood in Hesse, Germany.

The above observations will afford, I believe, a a tolerably minute idea of the places from which the alum of commerce is procured. Except the native *alum* of Solfatara and the *alum stone* of Tolfa, all the remaining European alum is made from alum slate, alum earth, and those substances which contain only the remote principles of the salt. We have no account how the *Levant alum*, which is exported

† "At Helsingburg in Scania, a turf is found, consisting of the roots of vegetables mixed with nuts, straw and leaves, often covered with a thin pyritous cuticle, which when elixated, yields alum." Bergman's Chem. Essays, vol. 1. p. 353.

* Dillon's Travels in Spain. 2d edit. p. 220.

from Smyrna is made, but we have reason to believe, from the facts mentioned in the preceding part of the essay, that a substance resembling the Tolfa alum stone is the material from which it is extracted.*

* I subjoin to this section, an analysis of some of the minerals noticed above.

Native Alum of *Miseno*, (Italy.)*	
In one hundred parts.	
Pure alum	47
Alum whose crystallization is promoted by adding potash,	29
Oxyd of iron, a trace.	
Sulphate of lime, do.	

* Klaproth's Analytical Essays, p. 266.

Native Alum of Freinwald. †	
Alumina	15,25
Potash	0,25
Oxyd of iron	7,50
Sulphuric acid and water	77,00
	100,00

† Klaproth's in Jameson's Mineral, vol. 2. p. 304.

Alum Earth.†

Charcoal	19,65
Sulphur	2,85
Silica	40,00
Alumina	16,00
Oxide of Iron	6,40
Sulphate of Iron	1,80
Sulphate of Lime	1,50
Magnesia	0,50
Sulphate of Potash	1,50
Muriate of Potash	0,50
Water	10,75
	101,45

† Klaproth in Jameson, vol. 2. p. 374.

*Alum Stone**	A. S. from Tolfa.	A. S. from Tolfa.	Hungarian A. S.
Alumina	43,92	19,00	17,50
Silica	24,00	56,50	62,25
Sulphuric acid	25,00	16,50	12,50
Potash	3,08	4,00	1,00
Water	4,00	3,00	5,00
	(Vauquelin) 100,00	(Klaproth) 99,00	(Klaproth) 98,25

* Aikin's Chemical Dictionary. Jameson, vol. 1. p. 403.

3. THE COMPOSITION OF ALUM AND THE MANNER IN WHICH IT IS MANUFACTURED

The nature of alum has been a subject of considerable controversy among chemists, and the knowledge we at present possess concerning it, has been acquired in a slow and gradual manner. According to Chaptal, the earth of alum was supposed to be chalk, by Stahl and Neumann. The first step to a correct knowledge of this substance was made by Geoffry and Hellot. They proved the identity of argil or alumine with pure clay, and in a short time thereafter, Margraaf and Pott, demonstrated, that alumine was the basis of this mineral. The acid combined in this substance, was universally allowed to be the sulphuric; and hence, according to the new nomenclature, alum should have been denominated a sulphate of alumine. On further examination however, it was found that a solution of alum reddens litmus paper, and exhibits other properties of an uncombined acid, and this circumstance led to the belief, that a superabundance of acid was present, or in other words, that it was a super-sulphate. These facts were noticed by the celebrated Bergman. According to his analysis, alum consisted of 38 parts of sulphuric acid, 18 of alumine, and 44 of water of crystallization. But he found that those solutions, which contained a great excess of acid, could not be brought to crystallization by the addition of lime, soda or barytes, but only by means of potash or ammonia, and he also observed sulphate of potash in many species of alum.—

From these circumstances, he appears to have thought that the alum of commerce is sometimes a triple salt, consisting of sulphuric acid, alumine and potash, although he was far from believing that all alum necessarily contains either potash or ammonia. The subject however remained in uncertainty till it came under the notice of the most eminent analytical chemist of the present day. To the acute researches of Vauquelin, we are indebted for the decision of a question equally interesting to the chemist and manufacturer. He demonstrated that alum, is a triple compound, a *super sulphate of alumine and potash*, and thus explained many circumstances, which before were mysterious.

In order to determine the component parts of alum, and to ascertain the necessity and peculiar agency of alkalies in its preparation, Vauquelin dissolved some pure alumine in equally pure sulphuric acid, the solution was evaporated several times to dryness to draw off the excess of the acid, and the dry and pulverulent residue being then re-dissolved in water, was brought by evaporation to various states of specific gravity, for the purpose of crystallization, but notwithstanding every precaution, a soft magna, consisting of crystalline flakes was all that could be procured. The solution which had thus constantly refused of itself to afford crystallized alum, began to deposit some immediately, on the addition of a few drops of potash, and by gradually adding the alkali drop by drop, as the deposition of alum ceased, the whole was converted into pure alum, without the smallest mixture of sulphated potash. On treating

another portion of the same pure aluminous sulphate, with carbonated soda, with lime and with barytes, no crystals were in either case produced.

It thus plainly appears that potash is required not merely to engage the excess of acid, otherwise soda, barytes and lime ought to have produced the same effect, but is an essential engredient. Again, if potash and ammonia unite only to the superabundant acid, the sulphates of potash and ammonia should occasion no change in the pure aluminous sulphate but on the contrary, if they form an essential constituent part of alum, then they should produce the same effect when combined with sulphuric acid, as when pure. To ascertain this, Vauquelin mixed a solution of sulphated alumine with a few drops of sulphate of potash, and the immediate effect was the production of octahedral crystals of alum. Sulphate of ammonia produced the same result.

It might still, perhaps, be objected that the action of these salts, as they are remarkably greedy of sulphuric acid, determined the crystallization of alum, by the simple absorption of superfluous acid. In order to determine this, some uncrystallizable aluminous sulphate was mixed with acidulous sulphate of potash, and afforded as great an abundance of alum as when the neutral sulphate of potash was made use of. Hence, no doubt can remain concerning the influence and particular mode of action exercised by potash and ammonia in the manufacture of alum.‡

From these facts, it thus appears, that the alum of commerce is a combination of alumine, potash

‡ Aikin's Chemical Dictionary. Rees' Cyclopedia.—Article Alum.

and sulphuric acid. The latter is in excess, or is slightly combined, and to this circumstance is entirely owing the taste, the solubility and most of the other external characters of the salt. On a more minute examination, however, small quantities of sulphate of potash, either alone or mixed with sulphate of ammonia, and of iron are detected in some kinds. The extraordinary influence of the last of these substances we shall notice hereafter.

The above observations on the nature of alum are preliminary to a proper understanding of the various modes in which alum is manufactured. We shall notice each in its order.

1. The manufacture of alum at *Solfatara*.

This it will be recollected, we stated to be volcanic. Fumes pregnant with sulphurious and sulphuric acids, are constantly penetrating the clayey soil, the former of which deposits a concrete sulphur, and the latter a saline efflorescence, which is aluminous. This, together with the earth to which it adheres, is daily collected and distributed into leaden cauldrons, so as to fill about two thirds of their capacity, water is then added, till it stands about three or four inches above the surface of the clay, and this in a few hours, by the assistance of the natural heat of the ground‡ alone, in which the cauldrons are set almost up to the brim, extracts the alum diffused through the clay, and deposits it in rough crystals on its surface. The evaporation, although slow, is uniform, and is carried on without the aid of artificial heat.—

‡ 45th of Reaumur (Chaptal.)

These crystals are taken out, and washed in the mother liquor, and then put with fresh water into other boilers, and again dissolved as before, by the natural heat of the ground. The solution is then run through a filter into large wooden coolers, and in a day or two, affords a large quantity of pure colourless crystals. It thus evidently appears that alum exists ready formed in the earth of the Solfatara and the whole of the manufacturing process is reduced merely to lixiviation and purification. A specimen of the earth, analyzed by Bergman, yielded 8 per cent of alum—and the Abbe Mazeas, from six pounds of the earth, procured by lixiviation, two pounds and a half of crystals, or about 41 per cent. The alum of Solfatara has never been analyzed, but as no potash or ammonia is added in the manufacture, it is evident from the preceding remarks, that the alkali exists in the ore.*

2. Manufacture of alum from *alum stone.*

The ore of La Tolfa forms veins of considerable hardness, which are separated from the rest of the rock, either by blasting, or by pick axes. The pieces thus obtained are brought to the calcining oven, which is merely a hole dug in a rising ground, four or five feet in diameter and from five to six feet in depth, with a lateral gallery, communicating with the open air and the bottom of the furnace,—resembling in fact, in almost every particular, a lime kiln. The bottom being covered with faggots of brush wood, the pieces of ore are skilfully laid over

* Aikin's Chemical Dictionary and Chaptal's Chemistry applied to the Arts, vol. 4.

them, so as to form a kind of hollow vault; between the interstices of which is an ample passage for the smoke. As soon as the fire is kindled, and the flames begin to appear between the stones, a workman is at hand to regulate the combustion, that it may be neither too great, nor too feeble. "If the "calcination is not carried far enough, there is one "part of the ore which yields no alum; if on the "contrary, it is pushed too far, the salt is decompos-"ed, which takes place as soon as any sulphureous "smell is perceived."† Gay Lussac who visited these works was informed by Mr. Regny, that this calcination was very delicate, and that it could only be done in the night, because that operation was shown to be at an end by a sort of light bubbling on the surface of the stone and by a change of colour.* The fire is now extinguished, and the stones are left to cool. The sign of this first process being well conducted, is, that the ore has acquired the sweetish astringent taste of alum.

The second process begins by piling the calcined stones in long beds on a sloping floor, the lower side of which is terminated by a ditch of water, extending along its whole length; from this ditch, the beds are frequently sprinkled, and the water draining from them, returns again into the reservoir: In about a fortnight, the stones begin to crack and break down, and at length, in forty days more or less, are over-

† This statement, made by Gay Lussac, is in contradiction to that of Aikin and other writers, who mention that the smell of sulphur is a sign that the ore has been sufficiently roasted.

* Repertory of Arts, 2d series, vol. 9. p. 51. "On the alum ore of Tolfa," in a letter to M. Berthollet, from M. Gay Lussac."

spread with a reddish efflorescence and reduced into a kind of paste. A leaden boiler is now half filled with water, and when hot, fresh portions of the prepared ore are continually stirred in, till a solution of sufficient strength is procured; the liquor, as yet turbid, is drawn off into another boiler, where it is subjected to a very gentle evaporation, at the same time that it becomes clear by the deposition of its earth. Having arrived at the point of crystallization, it is transferred by means of a pipe into a square wooden reservoir, seven feet high by five wide, so constructed as to be readily taken to pieces. Here it crystallizes in irregular masses on its sides and bottom. The mother water is poured out, to be boiled again with fresh alum ore in the first cauldron.

The alum of Tolfa, like that of Solfatara, it will be observed, is made without the admixture of any foreign ingredient. The ore and the manufactured substance have both been analyzed, and in each the presence of potash has been demonstrated. According to an analysis of Vauquelin, 100 parts of the latter contain 49 sulphate of alumine, 7 sulphate of potash, and 44 water; whilst the ore contains 43,92 alumine, 25 sulphuric acid, 3,08 potash, 4 water, and 24 silex. Calcination drives off the inflammable matter and appears also to effect a separation between the alum, and the excess of earth. Gay Lussac visited these works, and has given us some very interesting observations on the ore. He conceives that calcination is necessary, notwithstanding the acid is ready formed, on account of the silex.—

Fire expels the water contained in the stone and destroys mechanically its aggregation—or, which is the same thing, dilates unequally the alum and silex.—He could detect no sulphur in it, although this was the result of Bergman's analysis, and is therefore of opinion, that the sulphureous acid afforded by distillation, is the result of the decomposition of the alum by heat—oxygen gas was the other constituent—thus proving that sulphuric acid is present in the crude ore. In works of such immense commercial importance, it is to be regretted, that there should be any waste of material, but this seems to be the case from his observations. The pieces of stones employed in the process of calcination are nearly as large as one's fist, and it is hence impossible that the interior of them can have the same degree of heat as the exterior. He recommends to reduce the ore to smaller pieces. M. Regny, the director of the manufactory, also stated an important fact, in the manufacture to Gay Lussac, viz: that if the aluminous solution was too much boiled in the cauldron, there would be a deposition of insoluble alum, or alum saturated with its own base.*

3. Manufacture of alum from *pyritous ore.*

The remaining substances from which alum is extracted, resemble one another so closely in their constituents, that I shall notice them together. They contain generally bitumen, alumine or clay, silica, lime, magnesia, iron and sulphur, and differ merely in their proportions. The iron is uniformly mixed

* Repertory of Arts, 2d series, vol. 9, p. 51.

with the sulphur, thus forming pyrites, and it is the decomposition of this sulphuret, which occasions the formation of sulphuric acid, and its consequent combination with alumine and iron. Indeed wherever there is found a mixture of alumine, iron and sulphur, there exist the primary elements of the two sulphates; "and we may regard as alum mines, "those enormous masses of secondary schistus "which constitute so large a portion of our globe."† According to the predominance of these principles, the product of the decomposition will be different, as well as the object for which such mines are wrought. Thus, for example, when the bitumen is very abundant, with only a small portion of earthy and metallic principle, the mineral is termed pit coal, and is dug up for the purpose of burning. When the iron predominates, the mine is wrought for the sake of the copperas, and when the alumine forms the chief part of the mass, the object in view is to procure the alum. The best alum is obtained from the black micaceous species in which the pyrites is thoroughly disseminated through the mass in such small particles as to be undistinguishable from the rest. Such however as contain large nodules of pyrites, is very capable of being manufactured. This is the case with much of the Swedish ore. Even where the sulphur is too abundant for the pyrites, alum has been made, by distilling the pyrites and afterwards leaving the residuum to effloresce, as at Dilta in Nericia. In this place the process is com-

† Chaptal's Chemistry applied to the Arts, vol. 4, p. 43.

pleted by extracting from it, by lixiviation, the sulphates of iron and alumine.

At Whitby in Yorkshire, from which the principal part of the English alum is procured, a rock of alum slate twelve miles in extent, was discovered, which affords a most abundant vein of alum. The rock is torn open, after which the fragments are loosened in the form of plates or leaves, in the same manner as slate. Its colour is that of a dark grey slate, and between its laminæ are discovered small grains of pyrites, belemnites, and a great portion of cornua ammonis. This ore is laid in large heaps, and burned with wood or thorns, until it is white. These piles are sometimes 50 feet long and 40 high. It is occasionally burned by rearing a pile of the ore and of coal in alternate layers, kindling it at the bottom. When it is sufficiently calcined, it is put into a pit, about ten feet long, six feet broad and five feet deep, where it is macerated in water, for eight or ten hours; the ley is then drawn off into a large cistern or reservoir, and a fresh quantity of water is put on the calcined ore in the pit. This, after some time, having acquired a sensible but weaker saline impregnation than the former, is likewise run off into the cistern. From this the layer is conveyed into pans, where it is kept boiling for 24 hours. There is then added to it, a ley prepared from *kelp*, and after some time, the liquor is drawn off into a vessel, where it may settle and the impurities subside. When clear it is run into coolers, and is allowed to remain there about four days and nights, and a quantity of putrid urine, in the pro-

portion of about eight gallons to a ton of liquor is added. The alum crystallizes, the residual liquor is removed and mixed with the liquor obtained from a fresh quantity of materials, which is to be evaporated. The crystallized alum is washed, the water being allowed to drain from it. It is then melted in a pan, and while liquid is conveyed into tuns, in which it is allowed to remain about ten days, so as to become fully concrete; the tuns are then unhooped, and the large masses of alum broken down and stored for the market.* This is the oldest alum work in England.

In the preparation of alum at lord Dundas' works, in Yorkshire, *muriate of potash* is added, instead of kelp. The proportion employed is about 4 1-2 cwt. for every ton of alum procured.†

When speaking of native alum, I observed that it was found encrusting alum slate in the Hurlett pit or mine near Glasgow in Scotland—As a large quantity of alum has been procured from it during late years, it will be proper in this place to mention the process used. The mine itself is of coal, and a stratum of shale or slate, about ten inches thick, overlays the coal, and has been exposed to the action of the atmosphere above 200 years, the mine having been open during that period. It is also protected by its situation, from the infiltration of much water. Under these favourable circumstances, the natural formation of alum has taken place to a considerable extent, and is found disseminated in silky-like filaments, and even in congeries of small crystals, in

* Edin. Encyclopedia. Art. Alum. Chapter. † Edin. Encyclopedia.

interstices of the shale, accompanied with sulphate of iron. It is extracted by lixiviation, along with a portion of sulphate of iron, which has been formed by the same natural process. The ley is evaporated and the sulphate of iron is removed as much as possible, by priority of crystallization, and muriate of potash is then added. The ley is lastly evaporated to the specific gravity of 1,450, and is set aside for crystallization.†

The mines of Sweden, Norway, Hesse, and the duchy of Leige, are wrought nearly in a similar manner to that at Whitby in Yorkshire. In several, the mineral and combustible are stratified.—Calcination is thus performed more equally, but it is attended with considerably greater expense. There are others which contain the bitumen requisite to produce their calcination, and therefore do not need the addition of combustibles. Of this kind, is the mine in Garphytan in Sweden. Beds of bituminous schistus are laid in strata which are kindled, and over them are placed others that become inflamed in their turn. When the fire slackens or goes out, it is rekindled by means of lighted faggots, and the calcination is usually completed in the course of one month.* Alum is obtained in the same manner, at the mine near Milhaud in Avignon,† France.

Alum earth does not require calcination. In the mine of Schwemsal in Saxony, the mineral is soft, porous, lamellated and friable. The only prepara-

* Edin. Encyclopedia and Aikin's Appendix. † Chaptal.

tion used is to form it into heaps of 100 in height, by 20 or 25 in breadth, and from 12 to 15 in height, upon a hard clayey soil, with the sides gently inclining, so that the water which flows over their surface, may fall into a ditch, dug at each side of the heap, it order to receive it. These heaps remain exposed to the air during a period of two years previous to lixiviation; the waters are allowed to deposit the various undissolved matters they carry with them, after which they are poured into basins, where they are suffered to remain until they become sufficiently clear, and afterwards turned over into proper evaporating pans. The heaps at the end of the period above named, are found to be almost wholly in a state of efflorescence, or if some fragments still preserve their primitive form, they fall to powder on the touch, and display the alum ready formed between their strata. This mineral furnishes only two pounds of alum per cwt. The heay generated in the progress o aluminization is frequently so considerable, as to inflame the mass, in which case, in order to arrest the progress of the combustion, the heap is opened at the point whence it appears to proceed, and thus the heat becomes diminished.* At the manufacture of Flone, in the department of Ourte in France, a pyritous ore is used, which is considered very excellent. It is moderately soft and free from bitumen, and has the ingredients well mixed. Simple exposure to the air and moisture is all that is practised; but this process requires three years. They, however,

* Chaptal.

slightly roast the ore, after spontaneous efflorescence has taken place. This is a great improvement, since air along with heat, so highly oxygenates the metal (iron) that it gives out its superabundant sulphuric acid, which unites with the clay.*

To these (I fear tedious) accounts, I shall only add that in Helsingburg in Scania, where an aluminous turf is found, a great quantity of alum can be extracted by lixiviation. So also with the black earth of *Arragon*. The lixivium is put into boilers, and evaporated over the fire, till a thin scum appears on its surface like a cobweb, the liquor is then run into others vesels, where as it cools it crystallizes.‡

From the above statements it will be seen that exposure to air and moisture in the softer kinds of ores, and calcination in the stony and bituminous kinds, are necessary in order to develope the acid, and to unite it in part with the alumine. The English, Swedish, and German alum works, are mostly of the latter description, but there is some difference in the minutiæ of the process they pursue. In some of the Swedish, lixiviation is performed immediately after calcination, but in the English and German, the roasted ore is watered slightly, and exposed for a greater or less time to the action of the air, by which the sulphur of the pyrites is more completely oxygenated, and in consequence a larger quantity of alum is procured.

Having obtained the acid, the process of lixiviation next takes place. For this purpose, the mineral, in all extensive manufactories, is thrown into

* See a minute account of the fabrication of alum at Flone, by G. J. Christian, translated from the French, in the Repertory of Arts, 2d series, vol. 12. p. 48.

‡ Dillon's Travels, p. 222.

large shallow vessels, either of stone or wood, furnished with false bottoms, to serve for the purpose of a filter; water is then poured on and remains for twenty-four hours or more, during which it dissolves the greater part of the soluble salts; it is then drawn off and a fresh quantity of water added to exhaust the ore of all soluble matter. This second lixivium is of course weaker than the first, but it is afterwards concentrated, by being used, instead of water for thefirst lixiviation of the next parcel of ore—This lixiviating the mineral twice, is particularly done at Whitby in Yorkshire, and at Schewensal in Saxony, but there are some manufactories where only a single lixiviation is employed.*

Next to lixiviation, succeeds evaporation or boiling down, and this is done in large leaden cauldrons; those used in England being from 10 to 12 feet long, 7 to 8 in breadth, and from 2 to 3 deep. Lead is preferred, since copper is too expensive, and iron would decompose the alum. The lixivium is by some mixed in the boiler with the mother water of a preceding boiling, and the loss is supplied by fresh liquor, while in others the mother water is added towards the conclusion of the boiling. Chaptal prefers the latter course. In Saxony, where the liquor is uncommonly concentrated, the boiling is continued without interruption for eight days; at the

* "The lixiviated mineral not being fully deprived of the whole of "its alum, is in many manufactories formed into heaps as at first, and "suffered to remain until it again assumes a state of efflorescence. "This practice is followed at Schwensal in Saxony, but in other works "of this kind, the lixiviated mineral is re-calcined, in order to draw "from it a new store of alum. That of Christianoff in Sweden, undergoes twelve calcinations, before being thrown away as useless." Chaptal, vol. 4. p. 60.

end of this time, or any period in use at the various establishments, the termination of the boiling is regulated by the specific gravity of the liquor, and this is tested by a leaden hydrometer or Baume's areometer. Various other tests are however applied, such as the floating of an egg on it, and the crystallization of a cup full. Even in this state, the substance which has undergone these several processes, would have none of the properties of alum, unless another material were added, viz. POTASH. In Saxony, this is added after the liquor has been let off into a reservoir, but in England, it is poured into the boiler after the evaporation is finished. In Picardy in France, from 10 to 20 pounds of potash dissolved in water is poured into the cauldron of alum. Potash is essential, and although kelp be used in some places, yet its chief use is the potash, which this impure soda contains. The urine that is added in Saxony and England, produces ammonia, which also aids in saturating the liquor.

A single crystallization is not generally sufficient to bring alum to a proper degree of purity. It requires dissolving in boiling water, to remove the sulphates of iron and magnesia which it still contains, and in many manufactories it is washed with cold, before being dissolved in warm water. This accelerates the disengagement of those salts.

Having now gone through with a detail of the processes used in those places, where aluminous minerals are found, I should do injustice to genius, were I not to notice a discovery made by an illustrious chemist, of MANUFACTURING ALUM ARTI-

FICIALLY. Among the many splendid trophies which modern chemistry has reared to the sciences and the arts, this is one which demonstrates her superiority in a striking manner. Chaptal drew the idea of this undertaking from the modern process of making sulphuric acid, or oil of vitriol. In this, the requisite proportions of sulphur and nitre are mixed together, and brought to a state of combustion in a chamber lined with lead; the sulphur is thus acidified and converted into vapour, which by degrees unites with the water that overspreads the floor of the chamber and forms a liquid, dilute sulphuric acid. Chaptal instituted a similar process, only substituting dried clay for water. A chamber was erected at his laboratory in Montpelier, 48 feet long, 44 wide, and 27 high at the highest part. The walls were of common masonry, lined with a thick coating of white plaster, and the floor was paved with bricks, bedded in mortar formed of calcined and fresh clay. Upon this pavement was laid a second in order to cross and cover the joints which are formed by the bricks of the first, and the bricks of this second pavement were bedded in a layer of the cement invented by Chaptal, made of equal parts of rosin, turpentine and wax, and this was used hot. The roof of the room was of wood, but the beams were near to each other, and had longitudinal grooves from end to end, into which the boards were fitted, so as entirely to fill up the space between the beams. In this way, the whole of this large piece of timber-work was put together, without a single nail.

The chamber thus constructed, was lined with his cement, which was applied three or four times, so as to have a surface smooth and polished. The substitution of this cement, for a lining of lead, effected a vast saving in the first expense, and it has been found by long experience, to require much fewer repairs than even lead itself.*

The clay, according to Chaptal, should be of the purest kind, and should contain no lime or magnesia, and be as free as possible of iron. It is to be tempered with water and made into balls, of five or six inches in diameter. These are afterwards calcined in a furnace, and although they at first turn black, yet by a red heat, the carbonaceous matter is expelled and this colour disappears. They are then broken down into small fragments, and spread on the floor of the chamber, and exposed to the vapour of sulphur and nitre, and in a few days they are observed to crack and open, and to be penetrated with slender saline crystals. When an efflorescence is formed over all the earth, it is removed from the chamber and exposed to the air, that the acid may obtain its highest degree of oxygenation and become thoroughly united with the earth. It is now lixiviated, and sulphate of potash (which is a result of the combustion of sulphur and nitre) is added. The liquor is then transferred to a large vat where crystals of alum are shortly deposited.†

* The cement cost from 6 to 7000 livres; the lead would have cost from 8 to 900,000 livres.

† Chaptal's essay on making alum from its constituent principles, in Repertory of Arts, first series, vol. 2. p. 134.

The advantages of this process are numerous.—It may be carried on, wherever a supply of proper clay can be found. The manufacture is conducted with greater rapidity. There is a greater saving of fuel, and finally, as the materials are purer, the alum will be so also. Should we ever be so unfortunate, as again to enter into hostilities with those nations who supply us with this article, the above process will always enable us to rest in security on our domestic resources.

M. Berard, a pupil of Chaptal, has since the publication of the latter's memoirs, considerably improved the process. He now mixes the sulphate of potash with the argil at first—forms this in balls, which are calcined, and then sprinkled over with sulphuric acid.*

M. Curaudeau, also a French chemist, has published another process for making alum artificially. He dilutes 100 parts of argil, in a solution of five parts of salt, and forms a paste, to which he gives the shape of loaves, in order to calcine them in a reverberatory furnace. He then reduces the calcined residuum to a powder, and pours upon it a fourth of its weight of sulphuric acid, carefully agitating the mixture. When the fumes of the muriatic acid are dissipated, he adds a quantity of water equal to that of sulphuric acid, still continuing to stir the mixture. A strong heat is thereby produced, the composition swells, and water is added, till there is about eight or ten times as much as of the acid. After clarifying the liquor, a solution of potash is added, equal in

* Chaptal, vol. 4, p. 73.

weight to a fourth part of the acid employed. If the sulphate of potash be preferred, twice as much as of the alkali should be used. On cooling the liquor, crystals of alum are formed, amounting to three times the weight of the acid.†

To these, I will only add, a third method used in Chaptal's manufactory at Thernes near Paris, by M. Bouvier. He mixes 100 parts of argil, 50 nitrate of potash, and 50 of sulphuric acid, at 40 degrees of concentration. This mixture is put into a still, to which a receiver is fitted, when the distillation commences. The nitric acid is expelled by the sulphuric acid, and when the distillation is finished, the residuum requires only to be lixiviated in order to furnish alum of the best quality.*

4. COMPARATIVE VALUE AND PURITY OF THE VARIOUS KINDS OF ALUM.

In commerce, *Roman alum* holds a decided preference over every other kind. No better proof of this need be given, than the fact, that its price is double that of English alum. Manufacturers consider it as vastly superior for the more delicate colours, although they use the other kinds indifferently for coarser ones. This excellence of the Roman alum, and the tax which various countries have in consequence to pay for it, have induced scientific men, and particularly in France, to investigate the cause of the superiority. Vauquelin, Seguin and

† Repertory of Arts, 2d series, vol. 3, p. 305.
* Chaptal's Chemistry applied to the arts, vol. 4, p. 75.

Thenard have each instituted a series of comparative experiments on the various kinds. The former of these analyzed Roman, English and French alum, together with the alum of Liege. He found but little difference; the Roman contains more or less of ammonia—the English most, owing doubtless to the urine used in the manufacture. All also contained iron, except Roman, which gave only inappreciable quantities.* Seguin obtained similar results. He examined Roman, Levant or roch alum, English A. French A. and alum of Liege and of Sweden. The alum of Liege and of Sweden contained ammonia, the Roman none—All had minute quantities of iron in their composition, except Roman.† Thenard's and Roard's experiments led to similar deductions. "Can this quantity of iron," (says Vauquelin) "which amounts only to 2-1000 "in the most impure alum (of Avignon) produce "such a great difference in the properties of these "salts as to reduce their value to only one half "of that of Roman alum?" This question is answered decidedly in the affirmative by the experiments of Thenard and Roard. They found that the iron in those kinds, made the yellow of woad green and dull, altered that of cochineal, and almost always produced colours less lively than when Roman or pure alum is used. Those which con-

* Comparative Analysis of different kinds of alum, by M. VAUQUELIN, in Repertory of Arts, 2d series. vol. 5, p. 384.

† Memoir on the purification of alum, by M. SEGUIN, in Repertory of Arts, 2d series, vol. 26, p. 375. "In the Roman alum the quantity of iron was almost inappreciable. The Levantine contained 1-2000 parts, that of Liege, between 1-900, and 1-1000; English, between 1-700 and 1-800, and French, between 1-1200 and 1-1300."

tain ammonia did not appear to exhibit any thing differing from the results obtained by Roman alum.* It is therefore unquestionably the interest of every manufacturer to endeavor to free his alum from the iron it may contain.† But laudable and patriotic as have been the researches of French chemists, it is hardly to be anticipated, that alum made by the addition of foreign materials, will ever be so pure as that which is formed from an ore, as at La Tolfa, that contains all the necessary ingredients.

I add in this place, by way of caution, that some years since, two brothers, named Gravenhorst, manufactured at Brunswick in Germany, an imitation of the Levant, or roch alum, by the addition of arsenic and cobalt to common alum. This gave it a similar appearance, and the delicate red colour which belongs to the former. As this kind might prove dangerous in medicine, where alum is often used, it should be observed, that heat turns Brunswick alum of a green colour, and that it at the same time exhales an arsenical vapour. Roch alum, on the contrary, is converted into a white spongy mass.‡

5. USES OF ALUM IN THE ARTS.

Alum is used for a great variety of purposes. It is of the first importance to *dyers*, by cleaning and

* Memoir on Roman alum, compared with that which is manufactured in France, by Messrs. Thenard and Roard. Repertory of Arts, 2d series, vol. 10, p. 64.

† Thenard and Roard conceive that it may be freed of the iron by dipping it in a small quantity of boiling water, and stirring it incessantly, when cooling. Let it then be washed two or three times in fresh water and the purification is complete.

‡ Rees' Cyclopedia. Art. Alum. Bergman's Chemical Essays.

opening the surface of the substance to be dyed, rendering it fit for receiving the colouring particles, and at the same time fixing its colour. So also in *calico printing*. It also enters into the composition of *pigments* or *crayons*, as they generally consist of the earth of alum finely powdered and tinged for the purpose. *Tanners* employ it to restore the cohesion of those skins which have been destroyed by lime, and *vintners* use it in fining wines. In the making of candles, it gives them a gloss and firm consistence, and wood soaked in a solution of alum will not readily take fire. So also *paper impregnated* with it, is the most proper for the preservation of *gun powder*, as it also excludes the moisture of the air—and it is useful in whitening silver and in silvering brass without heat. It also is very useful in purifying and sweetening water that has become fœtid and unfit for use, either on long voyages or by remaining a length of time in cisterns—combined with charcoal, it will be found highly efficacious for this purpose. In medicine, it is used as an astringent, and when calcined, as an escharotic.

The above are some of those applications, by which the comfort of man is promoted. I will now notice one, which undoubtedly contributes to produce disease. I refer to the use which bakers sometimes make of alum, as an ingredient in bread.—The reason assigned for this is, that corrupt flour being mixed with good, the whole acquires a proper degree of cohesion on the addition of alum, as that pervades the whole mass and renders it of a due consistence. If this be used in large quantities, the

ordinary quantity of bread cannot fail of being hurtful to children, and to persons of plethoric habits.—An easy method of ascertaining whether it has been added, is by thrusting a heated knife into the loaf before it has become cold, and if it be free from that ingredient, scarce any alteration will be visible on the blade, but in the contrary case, its surface will appear slightly covered with an aluminous crust.

6. AMERICAN LOCALITIES OF ALUMINOUS MINERALS.

In the conclusion of this essay, I proceed to add such notices of the localities of aluminous minerals, and of the manufacture of alum in this country, as I have been enabled to procure.

Native alum has been observed in this country in several places, especially in Tennessee and Pennsylvania.* The native plume alum ore is said to exist in immense strata in Tennessee, pervading a considerable extent of country and can be dug in any imaginable quantity. A specimen of this kind was sent to Dr. Bruce, and is mentioned by him in the last number of his Journal.† It was taken from a cave in Cumberland mountain, Warren county, West Tennessee. These beds are always either in natural caves, or under the brow of a bluff, where they are sheltered from the influence of heavy rains or torrents of water. Native alum, in small quantities, has also been observed at Leyden (Mass.) efflorescing on argillaceous slate.‡

* Cleaveland's Mineralogy, p. 187.
† Page 265. ‡ Silliman's Journal, No. 2, p. 114.

Aluminous schistus occurs in Frederick and Washington counties (Maryland) and the east side of the Cococton range of mountains is chiefly composed of it. In some of the western counties of Pennsylvania, it has also been observed.* For the following localities of aluminous schistus, together with specimens, I am indebted to Mr. AMOS EATON, lecturer on botany and geology,—at Pownall, Vermont—about three quarters of a mile north of the Lebanon Springs, and about midway up the Catskill mountains. I have also been informed that an aluminous mineral is found at Blenheim, Schoharie county, in this state, but I have not learned its particular nature.

The following remarkable fact, for which I am indebted to the hon. Mr. JENKINS, mayor of this city, clearly proves that alum abounds at the town of Erie, on the borders of that lake, in Pennsylvania. In that place, the body of a distinguished American general, was interred several years since. His son about four or five years ago, came there for the purpose of taking up and removing his bones to Chester county, Pennsylvania. On raising the body, it was found in a high state of preservation, so much so that the features of the face were readily recognized by those who had previously known the general. The flesh was indurated to such a degree, that it could not be separated from the bones with a knife. The physician (Dr. Wallace) who had the superintendence of the preparations for the removal, was obliged to boil the corpse in water before it

* Cleaveland's Mineralogy, p. 365.

could be compressed into the proper compass.—This singular phenomenon is attributed to the saluminous salts, which abound in the place where the body was interred. Quantities of crystallized alum, adds Mr. Jenkins, are found on the surface of the ground.

Concerning the manufacture of alum in this country, I can only state, that an establishment of this kind exists at Salem, Massachusetts. The reputation of the article there made, is rising among dyers, and it certainly is equal in apparent purity and beauty of crystallization to either the English or Swedish alum. I have not been able to ascertain from what mineral it is manufactured.*

Of the foreign kinds, English alum is the most in use. Swedish and roch are also imported, together with a variety, called in commerce, *India alum.*—This is generally quite impure, and it appears to have a superabundance of alumine.

* A specimen of this alum was exhibited at the late Brighton fair near Boston.

Observations on Miscellaneous Subjects in Agriculture.

By JOHN NICHOLSON, Esq.

Read before the Society, Feb. 22, 1819.

Guinea Grass.

IN perusing "the Memoirs of the Agricultural Society of Philadelphia," I found the certificates of several cultivators in the now state of Mississippi, forwarded to the society by Dr. Brown of Natchez, on the growth, product and manner of cultivating a grass, lately introduced there, called the Guinea grass. The seeds, it appears, were first obtained from Africa, and brought to the island of Jamaica. It is a perennial plant, where frosts are unknown, but where these prevail, it must be planted yearly. It is planted in hills, about three feet apart, a number of seeds being put in each hill. Its growth is so rapid that it soon covers the ground, so as to prevent the growth of weeds. In good soil in Mississippi, it grows to the height of about ten feet, if left unmowed, in the course of the season. It is used there for soiling horses, and other cattle, and is well relished by them. It grows at the rate of from four to six inches in height in twenty-four hours, and may be mowed off five or six times in a season. It is also eaten freely by cattle when made into hay, if mown and dried while young and tender. One of the persons who furnished the certificates says, that he kept eight horses, on the soiling plan, during the whole

growing season, on the product of a fourth of an acre or this grass. Another says he weighed the product of one seed of the grass, and that the weight was thirty pounds. One again says, that its product is eight times, another says ten times, that of the best grasses which have usually been cultivated in more northerly climates.

In this state we have commonly about four and a half months free from frosts; in Mississippi about eight; of course its product here would probably be about five times that, of our best grasses; and it would therefore seem that, short as our growing seasons are, compared with those of more southerly latitudes, this grass might be cultivated here to great advantage, at least in particular situations.

The certificates were given by cultivators in the vicinity of Fort-Adams, near Natchez.

FIORIN, *or creeping bent Grass.*

In the memoirs just mentioned, accounts are published of trials made of the cultivation of this grass, by Judge Peters and others of Pennsylvania, the results of which were that the products were found to be at the rate of about five tons of hay to the acre in a season. The trials were however made on dry garden soils, which, it is well ascertained, are not so suitable for its growth as those which are quite moist.

It is cultivated by layers. The ground is first to be well prepared with the plough, and the surface made smooth with the harrow and roller; lines are

then to be drawn across the ground, about a foot apart, forming little furrows of a sufficient depth to afford a covering for the layers, which are to be laid along lengthways in the furrows, and slightly covered, and in due season sprouts will start up at every joint of the layers. The ground is to be kept clear of weeds until the grass extends over the surface, and fixes its roots in every part, after which it will require no further attention.

Perhaps the only objection to be made to this excellent grass is that it is troublesome to mow; but this is no objection to its cultivation for pastures; and the difficulty experienced in cutting it with the scythe is probably more than balanced by the saving of room necessary for storing it; as its bulk in proportion to its weight and nutriment, is not more than half that of red clover.

It would seem that there are varieties of the florin, and it is believed that some are more productive than others. It is said to be most productive in that part of Ireland which lies contiguous to the Giant's causeway; owing perhaps to a better variety being found there than elewhere. The layers may be brought from that place without inconvenience as it is said they will grow even after they appear to be in a dry state.

FEATHER GRASS.

A grass called by this name, has lately been introduced into North-Carolina, and from what I could learn and observe, it appears to be as nutritious and agreeable to cattle as our cats-tail or timothy grass

and considerably more productive. A planter there shewed me a lot of about an acre, of strong clay, sown with this grass, on which he said he had pastured four horses during the most of the summer, and the pasture was still tolerably good, this was in August last. This grass also appeared to flourish in the dry exhausted sandy soils of that country, where scarcely any other grass is seen to grow. It is perennial, easily cultivated, the seeds being sown in the broadcast way. I am induced to believe it a more valuable grass than our timothy; at all events, I am confident it is, for the climate of that country. It has some resemblance to the tall oat-grass (avena elatior) and may be a variety of that species. The seeds are small, and may be had by mail in a letter from Mr. Solomon Shepard, or Mr. Samuel Nicholson, near Murfreesborough, Hertford county, North-Carolina.

HEDGES.

In the memoirs before mentioned, a hedge made of the locust (robinia) is particularly recommended, having been successfully tried by a farmer of Pennsylvania. The young plants for the hedge are to be of the height of about four feet when set out. They may be raised from the seeds of the locust, or from slips or cuttings of the tree. In making the hedge a ditch is unnecessary; the young trees being merely set out in a line, at the distances of about ten inches from each other, in alternate slanting directions in opposite ways, and are then plashed or interwoven

together, exhibiting an appearance something like the following:

When this hedge has had about five years growth, it will be fit for the ordinary purposes of a fence, and may be kept in the growing state about twenty years longer; when the trees are all to be cut off, at the height of about five feet from the ground, in order that the stumps may serve as a fence as long as they will stand, which will be about twenty years more, forming, altogether, a good fence for about forty years.

The advantages of this hedge and fence are principally these: It is cheaply made, requiring little or no attention afterwards, and is soon fit for use. It soon becomes more formidable to cattle than hedges of slower growth; when cut down it affords a valuable supply of timber for various purposes, beside what is merely useful for fuel. Its growth enriches the land, and greatly increases the growth of grass near it, while its shade does no essential injury to the growth of grain; and, on account of the durability of the wood, the stumps will form an impenetrable fence for a great length of time, without the necessity of any repairs.

Judge Peters (of Pa.) has hedges of hemlock, planted on the banks of ditches, and he finds them

durable as well as ornamental. The trees are kept in the dwarf state by the use of the shears. Col. Taylor (of Va.) is very successful in making hedges, in a similar manner, of red cedar. Neither of these sorts of hedges require plashing, as the limbs extend almost from the roots, and form a close impenetrable thicket.

TRENCH PLOUGHING.

Judge Peters has trench-ploughed much of his lands to great advantage, where they had been considerably exhausted by hard cropping, the products after this operation being commonly more than doubled; and in addition to this increase of crops he has derived the further advantage of entirely eradicating the growth of the wild onion or garlic, and other weeds with which his lands were infested. In due season he has again trench-ploughed some of the same lands, turning up the old soil, which he found recruited and free from the seeds of weeds possessing any longer the power of vegetation. The lands which have been thus treated are of the deep loamy kind. He trench-ploughs in the fall, for the purpose of exposing the layer of earth newly turned up to the action of the frosts; and in the spring he gives it about forty bushels of lime to the acre, after which, with the aid of further ploughings, he finds it well fitted for the production of good crops. In one instance he raised a good crop of hemp from his newly trench-ploughed land.

This operation would not, however, prove beneficial to all sorts of land. Some lands have a tolera-

bly good soil for the surface, while this is closely underlaid with poor, cold, or sour earths, but little adapted for the growth of plants. Generally speaking, the strong deep loams, including those which have a due proportion of sand or gravel, clays and earths deeply mixed with vegetable mould, will be found to derive the greatest benefit from trench-ploughing, and these only, when the surface has become considerably exhausted with cropping.

WHEAT AND RYE.

In some parts of Great Britain a practice has of late years been introduced of feeding off fields of wheat and rye in the spring, and then of passing the harrow over the ground; the feeding and the harrowing being each found to be of essential service to the growth of the crop. The feeding is recommended to be done with small cattle, such as sheep, calves, swine, &c. and to be performed as suddenly as possible after the ground becomes sufficiently dry for the purpose of feeding and harrowing. It is also recommended to pass the roller over the ground after the harrow, for the purpose of again fixing such roots of the plants as may be disturbed by the harrow. The harrowing should evidently be done in a gentle manner, or in such way as is least calculated to tear out the growing plants, though the operation will tear them out less than is generally imagined.

The extraordinary product of rye, reported to the society some years since, by Mr. L'Hommedieu, need only be mentioned here for the purpose of observing that a product something similar may be had

of wheat, where the ground is made equally rich, and the crop treated in a similar manner. I have been assured that as much as at the rate of seventy bushels to the acre has been raised of wheat, by sowing it on very rich land and mowing off the crop when it had attained the height of about nine inches in the spring; the effect of which was, that the crop grew up thicker, and with a stronger stalk than before, and ripened without lodging, which it was supposed it would have done so early, as to have rendered the crop of little value had the mowing been omitted. Feeding off the crop is most probably the better way however, as in this way it is taken off more closely.

It seems to be reduced to a certainty that washing seed wheat effectually, and drying it with lime or gypsum before sowing, will prevent smut. Where the seed is smutty the washing should be repeated, rubbing and stirring it briskly about, at each time, till the water is no longer discoloured or turbid by the operation.

Another precaution is perhaps necessary; which is, not to suffer the wheat intended for seed to undergo heating in a mow; as smut is believed to be infectious, and from the effects of the heating, the grain itself becomes so infected that the most diligent washing cannot restore it to a healthy state.

Observations on the Use of the Roller.

By WILLIAM MAYELL.

Read before the Society, 22d February, 1819.

THE seasons of late years have been so unfavourable for the raising of winter wheat, that many farmers have either altogether or partially suspended its cultivation, and have raised spring wheat in its stead. The unfavourableness of the seasons for winter wheat has arisen from the want of snow to protect it from the intense cold of winter, and to prevent the frost from penetrating the ground below the roots of the grain. Land which has been frozen to a considerable depth, especially clayey soil, is raised above its former level by means of the expansive power of frost, and the young wheat plants, in the language of farmers, are *frozen out*. The consequence is, that in the spring, after the surface of the soil is dried by the influence of the sun, the roots are left detached from the soil, and of course the plants in such circumstances wither and die. Such is the extent of the evil, that in many instances the farmer is compelled to re-plough his land, and prepare it for a crop of spring wheat, and thus the seed, as well as the labour and time employed in sowing the winter grain, are utterly lost. Farmers, whose losses in such instances are great, are not the only sufferers—the community at large participate in the evil; and as spring wheat will not produce superfine flour, the reputation of that article in foreign markets, as well as in those at home, is greatly depreciated.

Perhaps the freezing out of winter wheat, is caused by the disposition of the land being such as to retain a redundancy of rain in the fall. Land that is comparatively dry cannot be lifted by the frost; because there will be little or no water to freeze and expand. Water, it is well known, expands by freezing, and of course occupies more space in a solid than in a fluid state. When it freezes in the interstices of the soil upon the surface of the earth, (because it cannot expand in a horizontal direction) it exercises its expansive power vertically, and therefore raises the soil with which it is mixed and united, and with the soil, the germinated seed.

In spring the ice is reduced to water and this is evaporated by the heat of the sun. The spaces it previously occupied become empty, and the roots of the germinated seed are thereby left detached from the soil, without support and without nourishment. To prevent an undue accumulation of water, upon land sown with winter grain, ridges, with a small degree of declension, seem to be well adapted. In such a case, gentle showers will penetrate to a sufficient depth to moisten the land and promote vegetation. And in cases of heavy and long continued rains, the surplus water will run off between the ridges and leave the soil sufficiently wet without drenching it; and when the winter sets in, and the frosts become severe, there will be but little water remaining intermixed with the soil to freeze and expand, and the destruction, caused by the freezing out of the seed, will be less extensive.

The evil arising from the freezing out of winter grain is sometimes remedied by the use of the roller—an instrument used by some farmers for this purpose in Europe. It is used sometimes in this state, and even in Albany county, upon grass land; principally to smooth it, and to render mowing easy and expeditious. It is used sometimes in fall, and also in the spring, and might probably be employed with considerable advantage in spring upon lands sown with wheat. The porosity of wheat land caused by winter frosts, migh tbe closed up by the use of the roller, and those wheat fields, which in springs that succeed a severe winter without snow, are doomed to be ploughed up, might, if rolled as soon as the land is sufficiently dryed, reward the husbandman with a bountiful crop of wheat, that would handsomely remunerate his former and latter labour, and greatly benefit the state.

From very long experience, the plough and the harrow have been found to be invaluable instruments in husbandry, to pulverize the land and fit it for the reception of the seed; and indeed frost seems to be a process designed by the bountiful Creator to assist the farmer in his labors. But these operations seem to be not quite sufficient without the aid of the roller. The land, after all the operations preparatory to the reception of the seed, after it has been broken up by the plough; the surface exposed to atmospheric influence; the seed deposited; and after nature's process of freezing, thawing, and evaporating the moisture of fall rains and winter snows, requires something more, and the roller seems to be

the instrument nature points out, as the last operation required, from the ingenuity and industry of man, to enclose the seed that has been sown, and to secure the precious deposit against every future casualty.

Analysis of the BELL *of the South Dutch Church, in the City of Albany, recently imported from Holland.*

Communicated in a Letter to the President,

By SAMUEL L. MITCHILL, M. D.

Read before the Society, February 22d, 1819.

New-York, Dec. 14, 1818.

MY DEAR SIR,

SINCE the date of my last, the report therein alluded to, to the Lyceum of Natural History, has been made, and that I may perform the task assigned me as acceptably as possible, for my Albany friends, I copy it from the record of last evening.

"The report of the committee to whom was referred for examination, the fragment of a bell received by the president from Albany.

"The committee have made a considerable number of experiments on the specimen, a part of which and the conclusions they drew from them, they offer to the Lyceum. A portion of the alloy was heated in a furnace until it fused; it being at the same time freely exposed to the action of the atmosphere. It melted in about the same heat that bell-metal usually does, and no uncommon appearance presented itself. The object of this experiment was to ascertain whether it contained any notable proportion of lead or zinc. Had the former been present in considerable quantity, it would have appeared in drops on the surface of the alloy before it underwent fusion; and the latter metal would have manifested

itself by a blue flame, and the formation of the oxyd or flowers of zinc.

"As, however, this experiment could not detect a very small portion of lead, and as it is not known how small a quantity of lead or other metal may injure the tone of a bell, your committee made a set of experiments in the humid way by which very delicate tests may be applied.

"A portion of the bell-metal was weighed, introduced into a glass vessel, and nitric acid digested upon it, until it ceased to act. When the solution was put to rest, a large quantity of white precipitate was deposited, and the supernatant fluid had a fine blue colour.

"The same fluid was decanted, and the precipitate repeatedly washed with distilled water. The washings were preserved and added to the decanted fluid. This solution contained all that was soluble in nitric acid, and might be copper, silver, lead and zinc. The presence of iron, arsenic and other metals, could hardly be suspected, though the tests for some of them were applied.

"To ascertain which of the suspected metals it contained, the following experiments were made :

"Muriatic acid produced no effect. Therefore no silver was present, as muriate of silver would have been precipitated.

Sulphuric acid, when added, did not disturb the transparency of the solution. It therefore contained no lead. This experiment is very decisive ; for a minuter portion of a salt containing lead, on being added to the solution, the sulphuric acid immediately produced a precipitate of sulphate of lead.

"The solution was now tested for zinc, and it appeared to be free from that metal, so that it could now contain nothing but copper; which was easily separated in its metallic form by immersing in it clean plates of iron.

"The copper weighed $\frac{84}{100}$ lbs. of the quantity of the alloy used in the experiment.

"It now remained to examine the white precipitate before mentioned, formed by the action of the nitric acid on the alloy. It evidently consisted of a metal oxydized by the decomposition of the acid, and could be nothing else but tin, as the lead, if any had been present, would have been dissolved in the acid, as well as any other metal that would be expected in this compound. The precipitate was collected, mixed with charcoal, and heated in a crucible, a button of metallic tin was thus obtained weighing $\frac{14}{100}$ lbs.

"The result of the analysis is, therefore, that the Amsterdam bell, consists of

Copper	84 parts.
Tin	14
Loss	2
	100

"So it appears there is no foundation for the suspicion, that the bell of the Dutch church at Albany, contains any lead, or any other metal than such as it ought to contain.

"Bishop Watson observes, that bell-metal consists of tin and copper; but that authors do not agree in the proportions. Some ordering 4 parts of copper to be melted with one of tin, and others ma-

king the proportions for bell-metal the same as that for gun metal, ten parts of copper to one of tin; to which they ordered a little brass to be added.

"It may be remarked, that in general, a less proportion of tin is used for church bells, than for clock bells; and that they add a little zinc to those of re-repeating watches and other small bells. It is probable, that this bell if re-cast, will have a better tone than it had before, and that it will not be so liable to crack; as it has been observed, that when an alloy of tin and copper is cast for the first time, it is very porous, and much less solid, than when repeatedly cast.

"JOHN TORREY,
"SAMUEL B. CORNING, } *Committee.*"

Miscellaneous Observations on Agriculture.

By GEORGE CLARKE, Esq.

Read before the Society, March 1, 1819.

THE Society in receiving this communication, will it is hoped make allowances for the deficiency of accurate statements, which however desirous and necessary in presenting a perfect view of the progress of husbandry and its concomitants, are as yet out of the reach and control of the Society or its members; both by reason of the limited state of the funds, not having yet warranted the adoption of a plan that might render this body the focus of general information in the several gradations of agriculture throughout the state, as also the immaturity of the various societies lately formed, which are not yet so modelled as to afford any other information than what we see advertised in the public papers.

Nevertheless, it must be extremely gratifying to witness the prevailing spirit that pervades all ranks, in promoting the better cultivation of the state. It must afford the greatest satisfaction to perceive the gradual steps, that are taking towards the completion of a system of fairs, which many years ago was recommended by this Society to be adopted from one end of the state to the other; and which to be rendered efficient, have yet to be regulated in orderly succession, so as not to interfere with each other, while on the other hand, they ought not to be so far apart as to create any delay or unnecessary expense to dealers, salesmen and drovers. The sea-

son of the year for holding fairs ought also in many instances to be more duly considered, and most probably the public attention will be drawn to this point, by observing an advertisement for a fair to be held in the spring at the village of Duanesburgh. The spring is indubitably the proper season for exhibiting seed horses and bulls, as the autumn is the proper season for the disposal of rams. The dairy, feeding and stock farmers, will soon know how to appreciate the spring, as well as the autumn fairs, and no doubt it will not be long before the interest and good sense of the various districts, will enable them to decide correctly on the season best adapted for holding them; and when they have become more general and sufficiently numerous, they can be so organized by legislative aid, as to render them highly useful to the community at large—thus realizing the expectations this Society has long cherished, and fulfilling the objects and intentions of the institution.

It is not to be expected for a year or two, that the barter and sales at fairs, will be so extensive and productive of so much good as they will be hereafter, when better understood by the generality of practical farmers: at present the transactions are chiefly confined to promoting the immediate interests of the counties wherein they are organized; and little encouragement has been given to the introduction of good stock from foreign counties. One instance of which was apparent at the last Otsego fair, where an enterprising farmer, by the name of Wilkinson, brought from Duanesburgh, three remark-

bly fine bred rams, of Mr. Dunn's Dishley breed, he was not able to dispose of any of them at a rate commensurate to their value, though there were gentlemen desirous of purchasing them, but could not obtain the means of conveying them home, without paying an exorbitant price for their carriage.—Hereafter such difficulties may be obviated, and probably will, so that individuals can be furnished with such stock as they may wish to purchase, and venders will be induced to bring more stock to the fairs.

Since Mr. Dunn's breed of sheep has been mentioned, as far as my experience warrants, I have no hesitation in recommending them as equal, if not superior, to any other breed in the state; and for domestic purposes, their wool in many instances has been proved to be more useful, while, as stock for a farm and for the butcher, they have been pronounced to be of the first quality.

The improvement of the stock of the state is not to be confined to sheep, much is wanting towards improving the breed of horses and cattle. The latter it is to be apprehended may be somewhat deteriorated, owing to the great purchases that have, this year been made, and the high prices offered have, in many instances, been too great for the breeders to withstand, who were in want of money; and it is generally believed that it is difficult to purchase at present, even in the western country, any real good stock, but at a very high rate. The want of fairs thus gives the purchasers of stock, for the beef market, a great advantage over the farmer who wants to pur-

chase for the purpose of improving his stock. The former, in consequence of the great demand for beef, and droving out of the state, can afford to employ several persons in purchasing; and generally, they are men conversant with their business, and good judges of cattle. They consequently buy wherever they can find the most thrifty and clever stock, while the farmer wishing to improve his stock cannot afford to travel about in search of clever young cattle, as his wants are small, tho' he could with advantage at a fair enter into competition, and afford to give a higher price. The result therefore is, that the vender on a general system of fairs, would obtain a better price, the breeder be able to select the best stock, which again would improve and keep up the best breed, the dealer, salesman and drovers be furnished with various stock, applicable to their purposes, without deteriorating the breed of the state, by taking off, as they now do, too many young and clever beasts.

The breed of horses is certainly deteriorating, and by good judges it is universally wished, that one or more high bred horses were imported.—There are many enlightened and enterprising agriculturalists, who are of opinion also, that the laws on horse-racing ought to be modified; but without entering into the merits of the law on that subject, I shall observe, that it is a general and prevailing opinion in Europe, that nothing contributes so much to improve the breed as horse-racing—that it enables the farmers to procure the best blood mares; to select the best blood and most bony horses; to cross them suitably for the purposes they may be hereaf-

ter wanted, and to obtain higher prices in consequence of their great improvement—for blood horses are more durable, better winded, more sinewy, finer eyed, harder feet, closer textured in bone, recover sooner from fatigue, and endure hard dry meat, better than under-bred horses—which properties, mingled with horses of larger frame and wanting those qualities, do in reality so much improve the breed, that it enables the farmer to obtain a much higher price for that portion of his stock, and consequently supplies him with the means of pursuing his business and avocations with spirit and enterprize. The advantage arising to the agriculturalist in keeping and breeding a good stock, is incalculable. Three year old heifers, that will fetch from fifteen to twenty dollars, will eat as much and require as much attention, as those that will bring from twenty-eight to thirty-three dollars; sheep which at three years old, seldom weigh more than sixteen pounds a quarter, and cut only three and a half pounds of wool, cost as much in keeping and attention, as those that weigh nearly thirty pounds a quarter, and cut from five to seven pounds of wool; but in breeding horses the difference between good and bad is still wider, differing at five years old at prices of from forty to three hundred dollars. It is to be hoped therefore that every attention will be paid to the improvement of that noble and serviceable animal.

Who with fierce spirit, and exulting pride,
  Undaunted bears his master 'gainst the foe,
Repels the surges of th' invading tide,
  And frees the land from misery and woe.

Ambitious also to promote his fame,
  Mark his exertions in the trying race :
His speed increases as they cheer his name,
  And crowds delight his pedigree to trace.

Nor yet inferior is his strength display'd,
  When he o'er mossy mead elastic bounds,
Snuffing the air, and of no fence afraid,
  Enjoys the sport alike with men and hounds.

In humble life, his useful aid he lends,
  To all the purposes that men require ;
Thus by his industry makes full amends
  And satisfies the wants we most desire.

Valued by all, he seldom meets abuse,
  Save in the wretch—polluting nature's laws ;
Yet with harsh treatment and severe misuse,
  He dies—obedient, in his master's cause.

Amongst the new grains that have lately been introduced, none appear to be so productive and so well calculated to answer general purposes, as the bald barley. This grain though not found to yield so much to the acre as the common barley, is more useful in making bread when mixed with rye or wheat flour, and possibly when better naturalized to our climate, with some improved mode for its cultivation, may become more productive and worthy the attention of farmers generally.

But taking into present consideration the state of agriculture best adapted to our means, it would probably be found most advisable and beneficial generally, to turn our attention to improving the cultivation of grain that is known to succeed. Therefore the great exertions that ought to be made, should be in improving the culture of grain already well

established amongst us, while a few able and enterprising men will always be sufficient to test and gradually bring into general use, new crops.

The community will be much more benefited by a steady and gradually improving system of agriculture, than by an experimental one, though the latter is necessary in promoting the general amelioration of the former; but a just medium is requisite, for men are more prone to be captivated with new things, and more highly esteem them, than to convert what is in their possession to more useful purposes.

It is the duty of this Society to promote enterprize and prune the exuberance of theory; to pay attention to probabilities, and when found to be practicable, to recommend them. We must always bear in mind the title of our Society, and rest content with promulgating such knowledge and philosophy as will be useful.

In the room appropriated to the use of the Agricultural Society of the city and county of Albany, are to be seen many important agricultural machines, amongst which is an excellent machine for slicing potatoes and turnips; two good mould ploughs, and a superior English drilling machine by Hill, with different sized boxes adapted from turnip seed to the size of bean seed, which are removed at pleasure. Mr. Rodgers' plough, made after the model of Wilkie's plough, is also worthy of attention, and the objections that were offered last year in a report to this Society being removed, there is no doubt, but it will be practically found to be the best sort of plough that can be used where the land is not too full of stumps.

Before I conclude this communication, I wish to suggest a plan that I think would be productive of much benefit, viz. " That the different agricultural societies of this state, should recommend to the farmers of their districts, the advantages that would result by forming themselves into companies, for the purpose of purchasing threshing machines; and that those machines should be used in common amongst them, subject to such regulations for their use and repair as the company should deem expedient." I shall not intrude on the time of the Society by a display of the advantages that might result from such a scheme, but will conclude with observing, that machines which save labour and time, save money; they consequently enable the agriculturalist to make more of his labour and time, while his profits increase.

OBSERVATIONS

On the Culture of Indian Corn and Potatoes.

By JOHN NICHOLSON, Esq.

Read before the Society, March 1st, 1819.

I find that cultivating these crops in alternate rows or drills, has been successfully tried in Pennsylvania, and farther to the south; and that the products of the crops have been found to average about a fifth more than if one half of the ground, growing them, had been cultivated solely with Indian corn and the other with potatoes. The advantages of this plan of cultivating the two crops would seem to be, firstly, that the Indian corn, by having double its usual distance between the rows or drills, is, on that account, more heavily loaded with ears; as it is found that this crop is much diminished in its product of grain, in proportion to the quantity of stalks, when grown too closely. Secondly, that the roots of each of these plants are, in this way, enabled to collect from the earth more of that particular food, that is properly adapted for each, than if the plants of either kind were grown separately by itself. The roots of plants extend much farther in search of food than is commonly imagined; so far, indeed, as to be imperceptible to the naked eye; hence, while in this case, they spread so far as to intermingle, each derives its particular food, without essential injury to the roots of the others.

Gypsum is found to have a powerful effect in assisting the growth of potatoes where the soil is suit-

able for this manure. The seed potatoes, whether cut or planted whole, should first be immersed in some fertilizing liquor, such as brine, or a solution of salt petre, and then dried by rolling them in gypsum before planting; and as much of this manure should be sprinkled on the hills or drills, as is usually given to Indian corn. This trifle of expense in manuring the crop will commonly increase the product as much as one fourth; and it would seem to be satisfactorily ascertained, by experiments recently and accurately made, that taking off the blossoms of the plants, as soon as they appear, will give a further increase of the crop of about a sixth more.

A planter in North-Carolina lately sent a cargo of potatoes to the West-Indies for sale, a part of which were exposed to the sun, after digging, a length of time sufficient to dry the surfaces of the roots, and a part was stored away in sand of the usual moisture of the earth, as fast as they were dug; and the result of these two methods of keeping them was, that the latter sold in that market for more than double what could be obtained for the former. It would therefore seem that the method last mentioned is much the better way of keeping potatoes for family use, until the approach of the growing season; when it becomes requisite to dry them, in order to retard, as much as possible, the process of their vegetation. Giving them a slight scalding at this season of the year, is also of service in preventing their growth.

The seed for a crop of Indian corn, should be soaked some hours in a strong solution of salt pe-

tre, and rolled in gypsum, immediately before planting, besides having the usual allowance of this latter manure to the hills or drills after planting. The soaking of the seeds in this solution is particularly recommended in all situations where there is danger of the crop being injured by early frosts; as it is found that this process not only assists the growth of the crop, but that it causes it to ripen as much as ten days earlier than it would were the process omitted.

In selecting ears for seed corn, the practice recommended by Mr. Cooper, of New-Jersey, of selecting from the most productive and perfect plants to be found, is, in this case, easily observed, and is found greatly to increase the product of the crop. Let the ears for seed, therefore, be gathered from such stalks only as bear two ears, and these of the longest, soundest and best filled to be found in the field. A late writer says, that by constantly observing this practice, he finds the product of his crops of Indian corn so much increased, that he now commonly gets as much as sixty bushels to the acre.

Lime is much used in Pennsylvania as a manure, at the rate of about forty bushels to the acre, or less where the lands are of the lighter kinds; and Indian corn is particularly recommended for the first crop after liming, as deriving at first the greatest benefit from the application of this manure.

It seems to be well ascertained that as much as one sixth more in product may be obtained by raising this crop in rows, or drills, than in the usual way of cultivating it in hills, and if so why is the latter

method persisted in? The labour and expense of cultivating the crop, in either way, is not essentially different; and when it is considered that when raised in drills the seeds may be committed to the earth with a drill machine made for the purpose, at an expense probably less than a fourth of that incurred in the usual way of planting, it would seem that the drill mode of cultivating the crop is eminently entitled to a preference. About the like addition may be expected to the crop of potatoes when planted in rows or drills, instead of the usual method of growing them in hills.

Three bushels of potatoes when steam-boiled, are worth as much as one bushel of Indian corn, for fatting swine, or other cattle. Corn for fatting should be either ground or steam-boiled, and the expense of either of these operations on one bushel of that grain is not essentially less than steam-boiling three bushels of potatoes: owing to the operation of boiling the former being much more tardy than that of the latter.

Perhaps it may not be amiss before closing to exhibit a short statement of the advantages to be derived from the practical operation of what has been above stated, and in order to this we will take two acres of such land as will, without manure, yield 30 bushels of Indian corn to the acre. The same land will yield, say 150 bushels of potatoes to the acre without manure. One acre is to be planted with corn, the other with potatoes, and the product will be—

30 bushels of corn, at 75 cents per bushel,	$22 50
150 do. potatoes, at 25 do. do.	37 50
	$60 00

Gain by alternate planting, &c. &c.

One fifth by alternate planting,	$12 00
One sixth by planting in rows or drills,	10 00
One fourth in the potatoes by manuring with gypsum, as above directed,	9 37
One sixth in do. by taking off the blossoms,	6 25
Say one sixth in the corn, by selecting the seeds as above directed,	5 45
Say also, one sixth in do by manuring as above directed,	5 45
	$48 32

OBSERVATIONS
On the Disease of the Gum Trees, called the Black Gum.

By E. C. GENET, Esq.

Read before the Society, March 1, 1819.

THE peach and the plum trees have generally been affected in this state, by a peculiar disease fatal to their existence. Various opinions have been formed on the causes of that disorder. Several hortularians have ascribed it to the work of insects, and others to meteors suddenly inflamed in the atmosphere. This last idea, if I am correctly informed, is due to Mr. Peter Yates, a member of this Society, who according to his theory, gives the name of fire-blast to the black gum. It is to be regretted that Mr. Yates has not communicated to the public his remarks on that subject, and though I doubt of its correctness, I admit, with pleasure, that his ingenious conjecture has led me to consider, if a principle not very dissimilar in its nature, but more extensive in its action, has not been the efficient cause of the malady which has destroyed almost all our peach and plum trees.

During my late residence in NewYork, from the year 1816 to 1818, all the peach and plum trees growing on my farm in the town of Greenbush were killed by the black gum. I have carefully examined the nature of that disease, which had not yet entirely subsided last spring, and I have found, that it is a carbonated excretion of the gum, generally fac-

ing the course of the sun. The bark, where those excrescences have affected the trees, appears extended and raised by the effect of an overflowing sap. The matter extravased is black, concrete, and bears a great resemblance to charcoal. It is easily reduced, and is lighter than the wood to which it adheres. The death of the trees affected has been slower where the excrescence was seated on the extremity of the limbs, than where it affected the body of the tree itself, and it does not seem that, in any instance, the evil has expanded through the system of the trees, and produced progressively, additional excrescences; but that, on the contrary, many trees have decayed and perished under the cancerous local action of a single excrescence. From these facts I am induced to discharge the insects from having been instrumental to the destruction of our fruit trees: the arrows of Apollo have, I believe, done all the mischief.

The gum of the peach and of the plum is a mucillaginous vegetable sugar, circulating in their bark, and liable to run out either by dilation or incision; that substance, comparatively speaking, is the blood of the gum trees, and when thrown out of their vessels it congeals like blood. The various changes of the atmosphere occasion an eruption of those juices, which, if not attended to soon, exhaust the plant and terminate its existence.

The great variations of our atmosphere, since the last eclipse of the sun, and the appearance of the spots within the disk of that planet, as well as the uncommon degrees of radiant heat to which we have

been suddenly exposed after periods of cold and damp weather, may, in pursuance of the circumstances above stated, account for the phenomenon so generally complained of; and we may safely conclude that the black gum is in reality a fire blast, produced not by meteoric fire but by the too powerful rays of the sun at certain periods.

Efficacious remedies could be employed to prevent or extenuate the fatal effects of the continuation of the same causes on the young trees intended to replace the dead. Those remedies are of two kinds, preventive and curative. The preventive are to protect, as much as possible, the trees in *espaliers* against the sun as well as against vernal frost, by the means of matts or other temporary shelters; and, if the trees are not in a situation to be protected in that way, the curative means are, where the accidents have happened, to scrape or cut off as soon as they are perceived the rind of canker or spots of black gum.

I admit that in some instances worms and eggs of insects have been found in the black gum seated on the limbs of the gum trees; but it is yet to be proved, whether insects have made the incision from which those excrescences have originated, or whether, following a natural instinct, they have not selected those repositories already formed, for the preservation of their eggs.

A large grub-worm, provided with powerful teeth, frequently excoriates the roots of the gum trees, which improvident gardeners have not grafted on hawthorns or other stock of the mespilus gender, or

fortified around their roots with blacksmith's cinder, brick dust or ashes; but I have never seen or heard of any of those worms, that had ascended much above the level of the earth, and I am satisfied that the small worms found in the black gum are destitute of the organ necessary to occasion in the bark of the tree a solution of continuity and a consequent expansion of gum or sap.

OBSERVATIONS

On various Subjects in Agriculture.

By JOHN NICHOLSON, Esq.

Read before the Society, March 15, 1819.

SPELT. (*Triticum Spelta.*)

This variety of the wheat tribe is cultivated by the German farmers of Pennsylvania, but chiefly for family use. The grain is probably as nutritious as that of any other of the wheat plant; but, owing to the flour made of the spelt wheat being of a yellowish cast, it does not command so high a price in the market. It is said to be the sort of wheat that composed the frumentacious tribute paid by the people of Germany in ancient times, to the then mistress of the world.

From what I can learn it would seem that the advantages of cultivating this wheat are, that it affords a considerably greater product in light, or poor, or exhausted lands, than the sorts of wheat commonly cultivated: It withstands the winter frosts better, when exposed to them by being uncovered with snow;—if thrown out of the ground, by the land being so wet as to be heaved by freezing, it more readily takes root in the spring;—and, what is often of great consequence, it is not liable to the depredations of the Hessian fly.

It would seem that this sort of wheat is better adapted than most others to much of the lands of this state, and that for family use it might be culti-

vated to advantage. Perhaps it might answer well in much of the lands of the eastern states, where the successful culture of the common sorts of wheat has no longer been found practicable.

GRINDING INDIAN CORN AND THE COBS TOGETHER.

This practice is much approved of in Pennsylvania for feeding and fatting all sorts of cattle. The cobs, with the grain on them, are broken in a manner somewhat similar to that of breaking gypsum in order to prepare it for grinding, and the broken cobs, and grain are then passed through the millstones together.

The cobs contain much saccharine matter; and this is perhaps the most nutritious of any of the parts of vegetable food. With regard to graminiverous animals it would seem, that in addition to the nourishment afforded by the nutritious parts of food, it has a stimulating effect from its bulk, in producing a sufficient degree of distention; and therefore such animals are not satisfied with eating merely the nutritive parts of food; they require to be filled, or distended, to a certain extent, in order to have the gnawings of hunger completely allayed: hence the addition of the cobs, ground with the grain, answers the twofold purpose of nourishing the animals, by the sugar they contain, and of affording that due degree of repletion which seems to be an essential requisite in their food.

ORCHARDING, CIDER, &c.

Mr. Coxe, of New-Jersey, planted eight orchards, each of which, as a matter of experiment, were treated in a different way in planting; and that which proved most thrifty of these eight, or, as he says, the most flourishing of any he had seen in that part of the country, was planted in the following manner: he dug a hole for each tree about four feet in diameter, two spadings deep, and laid in each a plentiful quantity of a compost of river mud, sand and lime. The first mentioned ingredient being much the largest proportion of the mass, the trees were set in this, and the holes filled with the best of the earth previously thrown out. A waggon load of the compost served for about every fifteen trees.

It is probable that lime is the most efficacious ingredient in this composition; and that it serves the twofold purpose of powerfully stimulating the growth of the trees, and of preserving the roots from injury by insects: as lime is a repellant of these as long as it retains its caustic quality. No doubt the extent to which the holes were dug was also of essential service. Probably also the river mud had some proportion of common salt in it, from its being covered with sea water, by the flowing of the tides; and that the salt, as long as it remaind in the compost, was beneficial in keeping off insects, and assisting the growth of the trees.

Mr. Wynkoop of Pennsylvania, has an orchard of about 200 of the Virginia crab apple tree, which is an alternate bearer: every bearing year he makes

about 100 barrels of cider from this orchard, which is of about 20 years growth, and he sells this cider in Philadelphia for about $14 per barrel. He racks off the cider six times before he considers it properly prepared for market; first, from the lees, when the first fermentation nearly subsides; second, from the lees, after the cessation of this fermentation; third, preparatory for fining it with isinglass: this is dissolved by boiling it in some of the cider, and when sufficiently cooled it is poured into the casks and well mixed with the contents of each, and after the isinglass, with all the impurities of the liquor, has settled to the bottom, the fourth racking takes place, and after the slight fermentation, produced by this, the fifth; after which the liquor stands till the month of April, when it is again racked off, and soon after is fit for market. The cider of this apple, prepared in this way, has been taken for champaigne.

It is believed, however, that skim milk, about a quart to a barrel, is just as good as isinglass for fining any liquor whatever. Let it be well mixed with the liquor. Even the colours of liquors may be taken away by repetitions of this process.

The Virginia crab apple is quite different from that found in this state.

Most apple trees are alternate bearers, but some bear yearly, and plentifully each year. I remember an apple tree that had been growing about 25 years in my father's orchard, in Orange county, that yielded a yearly average of apples sufficient to make three barrels of cider. One such tree is worth ten

of such as commonly compose our orchards. An important enquiry therefore is, would scions, taken from such tree, and grafted on any other stock, produce a tree that would be a yearly and plentiful bearer, like the parent tree, or would its bearing, both as to time and quantity, be regulated by the disposition of the stock on which such scions were engrafted? I believe the disposition of the scions regulates that of the stock, particularly where this is engrafted upon as soon as it is fit for that purpose; and if so there is no difficulty in rearing orchards at least six times as productive of fruit as those raised in the common way; as all that is necessary in such case is to make the best possible selections of scions from trees, wherever found, which bear yearly, and plentifully, of such apples as make the best cider, or are best adapted for whatever purpose they are wanted.

The alternate bearing of apple trees is said to be acquired principally from habit. Wherever the young tree commences its bearing with an over plentiful crop it becomes so far exhausted by the operation as to be unable to bear the next year; but this period of rest recruits it sufficiently for bearing too heavily the third year, and thus its habit of alternate bearing becomes fixed. This habit, it is said, may be prevented by taking off one half, or more, as may be indeed necessary, of the young fruit, while very small, the first bearing year, and to repeat the operation for some of the following years, taking off a less quantity each year, till the habit of yearly bearing becomes confirmed.

It would seem that some of the best varieties of

the pear tree should be more generally cultivated, particularly in stiff soils. They bear yearly, and commonly in considerable plenty, and the liquor made from them (perry) is superior to cider. Mention is made in the letters of Espreilla that the juice of the fruit of a famous variety of this tree, cultivated in England, called the *Teignton squash*, had been sold in London for champaigne. It has also been found in Pennsylvania that the juice of the quince affords a liquor equal to good wines.

It is said that when fruit trees are raised in a nursery where the soil is poor, and are transplanted into a better soil, the trees will grow more rapidly than they would had they been raised in a nursery of such soil as is best adapted to their growth.

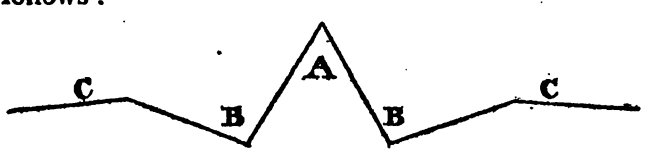
GYPSUM.

Col. Taylor, of Virginia, has published the result of all his experiments, in the use of this manure; and those which seem the most important, and the least problematical, are as follows: 1. Gypsum has little or no effect on lands newly cleared. 2. It has no effect on lands which have been exhausted with severe cropping, until such lands are first considerably recruited with lime, or other manure, in order that a pabulum be thereby afforded for the operation of the gypsum. 3. If the weather be, for some considerable time, either very wet, or very dry, after the application of the gypsum, it will have little or no effect. 4. Lime is a more powerful assistant to the operation of gypsum than other manures. Judge Peters (of Pa.) also says that the foregoing is agree-

ably to his experience; and further, that though he has frequently applied gypsum to growing crops without effect, yet he has invariably found benefit from wetting seeds, of every kind, and then rolling them in this manure, before committing them to the earth. It has also been discovered, in the state last mentioned, that the mere strewing of gypsum over the ground, underneath fruit trees, is an effectual remedy for preventing the fruit being injured by the late spring frosts. Gypsum is well known to attract moisture very powerfully. Lands strewed with this manure have more than double their usual quantity of dews. Hence it would seem that all the moisture in the air surrounding the trees, is drawn, by the gypsum, to the ground, and thus the young stock of germinating fruit remains uninjured.

FENCE.

A fence formed of a bank, properly made of the contents of two parallel ditches, having the bank between them, and covered with the sward pared off on each side, is much approved of in lands suitable for the purpose; and more particularly where the bank has a small addition of board fence, which costs but little, placed on the top. The end view of the bank and ditches when formed, appears as follows:



A. The bank, covered with the sward taken from the surface where the ditches are dug. B B. The ditches, with a gradual rising slope on each side towards the surfaces of the fields on each side, marked C C.

The elevation of the sides of the bank, when completed, and covered with the sward pared off from the surfaces of the earth to be dug for the ditches B B. should be about 55 or 60 degrees. The height of the bank is to be regulated by the height of the board fence intended to be set on the top. Say, for instance, that this is to be two feet high, by having three strips of board nailed to the stakes drove into the top of the bank, each strip to be four inches wide, and four inches apart; in that case the bank need not be more than three feet in height from the bottom of the ditches; but if but two strips of boards are to form the fence on the top, the bank is to be made proportionably higher. The stakes to which the strips of boards are to be nailed may be equal to about three inches square, sharpened at the lower ends, and drove about 16 inches into the top of the bank.—They should be of the most durable wood, and the lower ends considerably charred, by exposure to fire, which will make them last much longer.

Say, that with stakes and boards of good durable wood, the fence on the bank thus prepared would commonly last about 30 years; the cost of it would probably not exceed 50 cents a rod. The expense of making the bank, three feet high, would cost about 50 cents a rod more. The banks at the end of the 30 years would cost, say, 25 cents a rod to repair

them; making the next 30 years expense of the bank and fence only 75 cents a rod. But suppose the whole to cost double the amount stated, would it not still be one of the cheapest kinds of fence? No fence whatever would require less expense in yearly repairs than this—indeed scarcely any would be found necessary.

A particular excellence that this construction of fence is found to possess is derived from the shape of the ditches, and there being one on each side of the bank. Cattle, in order to leap over a fence, require to stand near it, and on level ground, so as to be enabled to spring with the greatest effect; but here, on an approach sufficiently near to the fence, the fore feet of the animal is sunk so much below its hind feet that it finds itself totally disabled from making any effectual attempt at leaping. At the same time the bank is too steep to climb, (for so it should be made,) and has too much weight and solidity to be prostrated by even the most strong and breachy animal; nor can such come sufficiently near to the fence on the top of the bank to be enabled to attempt the demolition of that with its horns.

The lands in which a fence of this description is best adapted, need hardly be mentioned to the intelligent cultivator. He will readily perceive that in lands liable to be washed by rains, this sort of fence would not be advisable, unless particular pains were taken to render the earth composing the surface of the ditches impervious to the effects of water running over them. This would probably be best effected, in most cases, by strewing grass seeds, suit-

able to the soil, over the bottoms of the ditches, and then giving them a dressing of gypsum or other suitable manure. The earth forming the surface of the newly made ditch is at first more or less barren; but it soon becomes more prolific by exposure to the sun and the air. It is advisable also to give the banks yearly dressings of the gypsum; for this manure will suit every sort of earth that is laid dry, as the banks must naturally be, and they will, on this account, be so much more productive in grass as amply to repay the small expense of the manure necessary to be given them.

I am informed that fences are made in Dutchess county, of banks of the above description, without any addition of board fence on the top; but in such case, they are made considerably higher.

While the board fence is standing on the bank, a hedge, formed of some sort of shrubbery, valuable for its fruit, may be brought forward to serve as the future fence; and for this purpose, it would seem that the quince tree might be successfully used; it would be sufficiently strong, and would yield a valuable fruit, as it is found that the liquor made from its fruit is equal to good wines. The bearing limbs of the trees would be sufficiently out of the reach of cattle. The myrtle and the sumach may also be mentioned for the purpose. A shrubbery of small growth may be sufficient, as it may be greatly strengthened by running a line of small, light, durable poles, or lath, sufficiently strong, along in the line of the hedge, to be supported, at a suitable height, by resting on the limbs of the shrubbery,

and having the ends of the poles fastened to each other. In this way the line of trees are mutually supported by the strength of each other. In Pennsylvania, where this is practised, it is found that a young hedge of thorn, soon becomes sufficient for the purpose of a fence. When poles are used for this purpose they should be cut when the bark will peal off; as stripping them of the bark, will greatly extend the term of their duration, and at the same time render them much lighter without diminishing their strength.

WILD RICE.

The plant which has this name is found in abundance in many of the waters of the more northerly regions. I believe it is not found much south of the 43 deg. of north latitude. It covers an arm of the bay of Little Sodus in lake Ontario. It grows on lands covered with water to the depth of from one to four or five feet. It is said to be as well tasted and nutritious as the rice of more southern climates, and is perhaps more easily pulled. It would seem, however, to be a species of the oat tribe of plants.

Would not this plant grow in waters of more southerly climates, if the seeds were sown in suitable waters, and those of proper depth? The seed is easily obtained; the trials are easily made, and if successful, might be found a considerable source of wealth; as it has the peculiar advantage of growing without any farther labour than sowing it, and on lands which are useless for any other purpose. I be-

lieve, however, that it requires a soil or bottom of rich earth; but such are to be found in much lands which are constantly covered with water.

WATER CHESNUT.

This tree is cultivated in China, in lands covered with water to the depth of from one to three or four feet. Perhaps it does not require so rich a soil or bottom as the wild rice just mentioned, and would flourish where that plant would not. It affords a nut equal in size and taste to that of the chesnut cultivated in France, Italy, &c. &c. The nuts are merely dropped in the water, where they take root in the bottom, and thus render lands productive of wood and fruit which would otherwise be of no value. Could not the nut of this tree be brought here and cultivated in many places to great advantage?

WATER LILY.

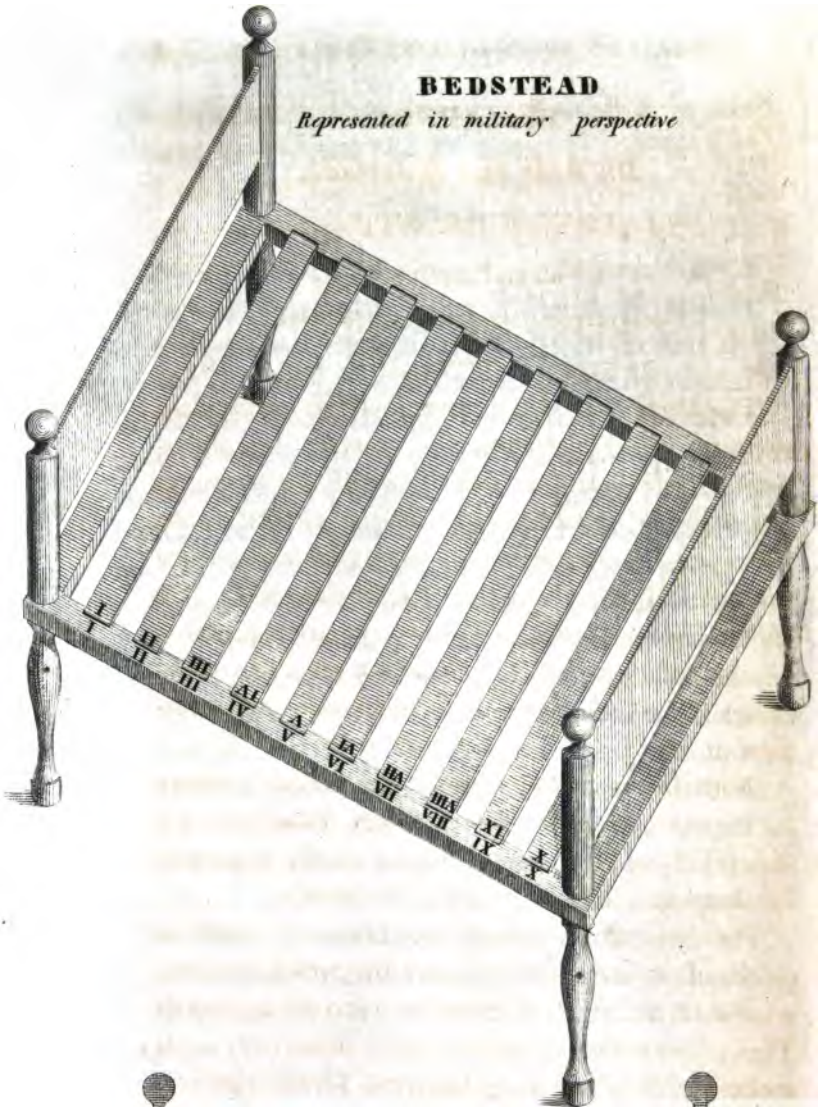
This is another valuable Chinese plant that is grown in marshes, which in their natural state are valuable for no other purpose. The seeds of the plant are merely dropped in ground covered wholly, or at times, with water; and the roots of the plants grow, without any further trouble, sometimes to the length of 15 feet, on or near the surface of the earth, and of the thickness of a man's arm. The roots are said to be as nutritious, and well tasted, as our carrot or parsnip. Could not the seeds of this plant be also obtained from that country? For further particulars of this plant and the water chesnut, see

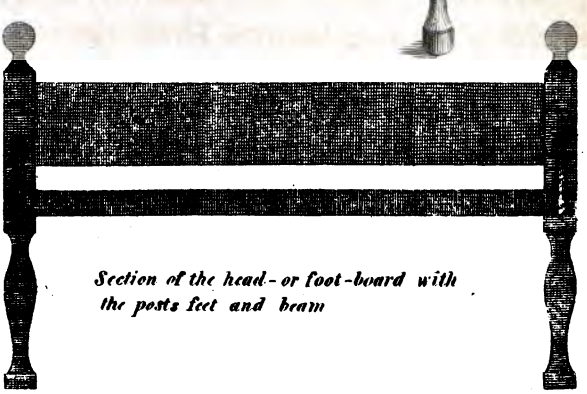
the Edinburgh Encyclopædia, published in this country by Whiting and Watson.

CAMEL.

From the best information, it would seem that the Tartars have naturalized this animal to the climate of the country surrounding lake Baikal in Asia; a climate as cold as that of the more notherly parts of this state. It would seem, however, that the camel must be gradually enured to the rigors of more northerly climates, and that if too suddenly removed from his native to a colder region, he loses his natural docility, patience, and other valuable qualities.

A camel will carry about 1000 pounds, a dromedary about 600, as far in a day as the driver can conveniently follow, and on any kind of road. One driver is enough for several of either of these animals. The expense of transporting on the camel of either kind, is not more than a sixth part of that incurred in our usual method of land transportation. Ought we not to copy the successful example of the Tartars, by taking steps for having the camel race gradually enured to the climate of this country? Perhaps the lama, the smaller sort of camel of South America, might also be gradually enured to our country.





Section of the head- or foot-board with the posts feet and beam

REMARKS

On Beds and Bedsteads.

By SIMEON DE WITT, Esq.

(With an Engraving.)

Read before the Society, March 15th, 1819.

TO obtain the greatest enjoyment at the least expense, is the perfection of economy. But this is true only in its fullest extent when all things are taken into the account—the smallest as well as the greatest. A greater saving is indeed made when this rule is applied to great objects than when it is confined to small ones, but true economy requires an equal attention to all, and embraces all those minor things which constitute the conveniences and comforts of life.

With this view, and without any further apology for the humble nature of my subject, I shall take the liberty of making some remarks on the apparatus for sleeping—that is, *Beds and Bedsteads.*

The frames of bedsteads are commonly made of pieces of timber joined together by screws or otherwise so as to admit of being occasionally separated. This construction is inconvenient, inasmuch as it makes it difficult to keep the parts firmly together. The bottom on which the bed is laid is made either of cords crossing each other, or of canvass stretched across the frame. In either way it is impossible to keep it horizontal. The middle part will of necessity be the lowest when a weight is on it, and if two

persons lie in one bed, the consequence is that each must lie on a declivity—a position extremely uncomfortable. For remedying these defects in a manner the most simple and economical, I have constructed a bedstead, of which a drawing is presented. It is done in the following manner :

Of well seasoned timber three inches square, a frame is made six feet eight inches long and five feet wide, outside measure. This is a proper size for what is called a double bedstead. The beams of it are permanently united by tenons and glued together so as to leave no crevices between them. Two posts about 22 inches high are joined together by a head-board mortised and glued in them, and of such a length as that the posts shall stand exactly on the centre of the junction at the corners of the frame, through which holes are made with an inch and an half auger at right angles to it. Round turned feet, about 20 inches long and three inches thick at their tops, are made with screws at the upper ends projecting six or seven inches, and of such a thickness as to fit the holes at the corners of the frame and enter female screws in the bottom of the posts. The feet are then screwed into them till they firmly unite themselves to the frame and the posts which are joined to the head-board. The foot-board, with its feet and posts is managed in the same way. Across the frame are laid slats or pieces of straight grained white-pine boards, three quarters of an inch thick and three inches wide, and the same distance apart from each other, with their ends sunk into the frame so as to make an even upper surface with it. Corresponding marks are made on them and the frame so

that when taken out each may be again put in its proper place.

Such a bedstead can be put together or taken apart in less than ten minutes. Its parts are so firmly joined to each other as not to admit of that movement which in some produces a most disagreeable noise. There will be no crevices in it in which bedbugs may harbour, and the bed on it will always lie horizontal, a circumstance essential to a comfortable resting place.

Excepting where beds are placed in rooms occupied for ordinary family purposes, bed curtains are useless, and they are now generally discarded.—Should, however, long posts be required for a curtained bedstead, they might be slipped into holes made in the tops of the short posts, and if knobs be fitted on them in the same manner, the same bedstead may be occasionally used with either short or long posts.

The most proper method of making a post is this: Take a piece of timber that will admit of being finished three inches thick and sixteen inches long, through which from end to end bore a hole with an inch and a half auger. Into the ends then drive turned plugs, to serve as centres on which to turn the post. That being done, in the one end make the female screw to receive the male screw, already mentioned, at the top of the foot to which the post is to be joined. Into the other end fit the spindle of a knob or other ornamental device, which may be taken off and a long post put in its place, if such should be required; but should long posts not be

required, the knobs may be permanently glued to the posts.

The bed is to be a mattress, stuffed with husks of Indian corn. It is made in the following manner: After preparing the tick to suit the size of the bedstead, fill it evenly with the husks, well dried and cleared from the pieces of cobs that may stick to them, so that when finished the mattrass may be four, five or six inches thick. Then, at intervals of about nine inches, run a strong twine through the mattress perpendicularly from the upper to the lower side, and back again about half an inch from the same place, and on the upper side tie the two ends of the twine together, drawing them moderately tight. This is necessary to prevent the filling from shifting.

If greater perfection be aimed at, the husks may be coarsely hatchelled. This may be conveniently done in the following manner: Through a piece of narrow board, in a longitudinal line, drive sharp pointed nails of wrought iron, about a third of an inch apart from each other, and fasten this board with the points of the nails upwards on any sufficiently firm support. This will then serve as a hatchel to prepare the husks for the mattrass.

The husks of corn are soft, elastic, and will not crumble. In these respects they resemble hair, which is used to stuff the best mattresses, one of which will cost from forty to fifty dollars. The comparative cheapness of the one now described can easily be estimated, and its excellence will be little inferior. Such a mattress will be found to be much cheaper than a feather bed, and will, I am confident, be pronounced much more comfortable on a tried

of both for a sufficient time; and what is of more importance, it is much better adapted to give that refreshment after the labours of the day, which is so essential to health and a revigoration for succeeding labours. For which purpose it is necessary that the body should be so laid as that the limbs may not press on each other, and this can only be in a horizontal posture, which full stuffed feather beds laid on corded or sack bottoms will not admit. On them the central parts of the body will sink the lowest, and the joints cannot be in that state of relaxation which is required for restorative sleep.

I have tried both feather beds and mattresses, and am so thoroughly convinced of the preference of the latter, laid on slat bottoms, that I have not for many years, in my own house, laid on any other.

Straw beds are generally laid under feather beds. A mattress made of common tow cloth, well filled with husks, would be preferable. And to make a bed in the best manner, one of this kind may be laid under the one I have recommended. Indeed the upper mattress may be also made of tow cloth, which put in a case of check would be sufficiently neat, and cheaper than one made of the usual ticking, while it would better answer the purposes of cleanliness, as the case may be taken off and washed without any inconvenience.

I flatter myself that these remarks on the apparatus of sleeping, may be a lesson of some use in the art of combining comfort and economy in a most important article relating to the enjoyments of life, and as such I recommend the consideration thereof to my countrymen.

DESCRIPTION
Of Montgolfier's Hydraulic Ram.

(With an Engraving.)

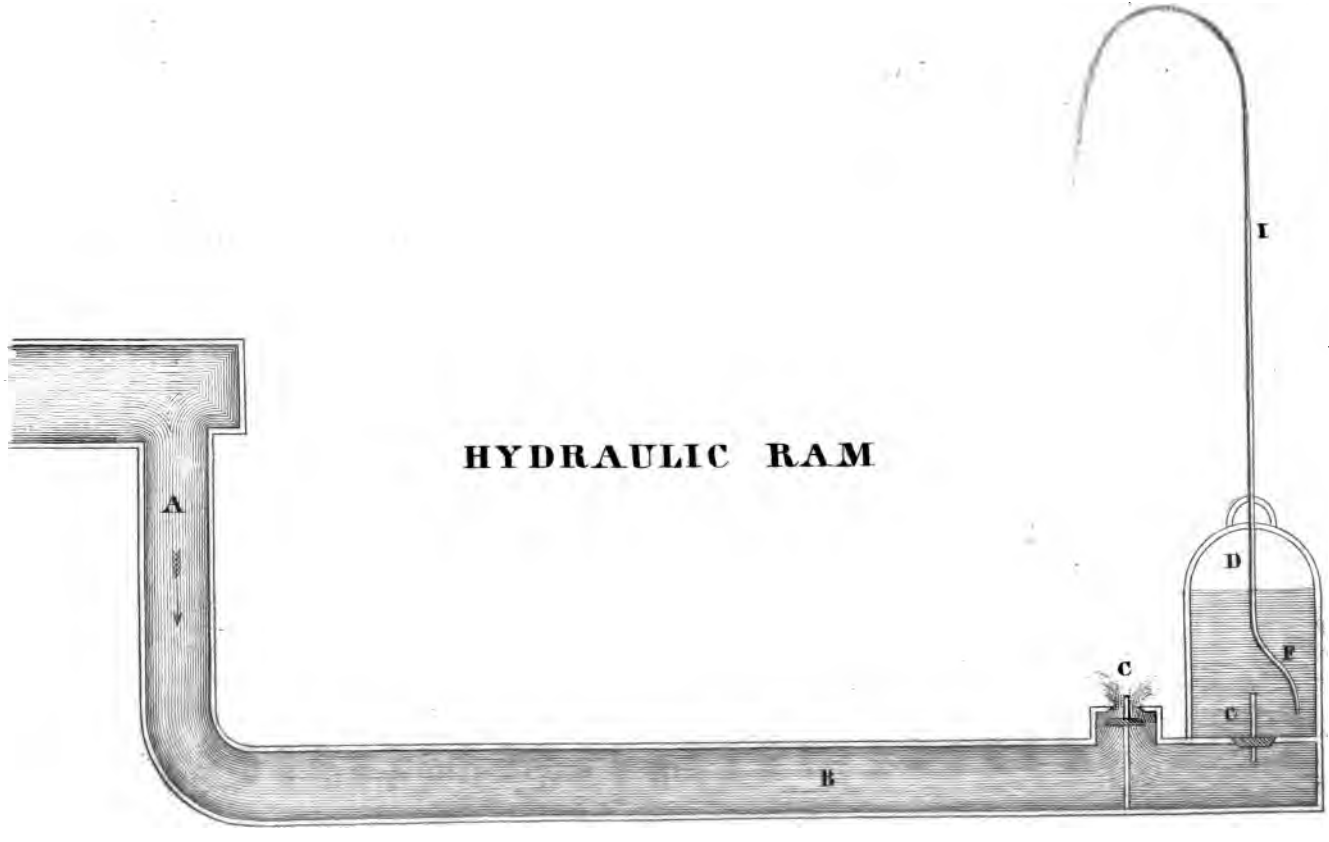
By E. C. GENET, Esq.

Read before the Society, March 15, 1819.

THE celebrated Montgolfier, who having submitted fire and air to the power of man, invented ærostation, or the art of navigating in the air, has also discovered the art of raising water above its level, without any other agents, but the pressure of its fall combined with the elasticity of air. The ingenious machine, by the means of which, that problem has been solved, has been called by that great man, an hydraulic ram, on account, it is supposed, of its mode of acting, similar in some respects, to the operation of another instrument, also called a ram, in architecture, and used to drive piles by the fall of a heavy weight.

Montgolfier had established a large paper-mill and paper hanging manufactory, on the banks of a stream, which had but little fall, and he undertook to raise the water of that stream to the summit of his building to move certain machinery. The various hydraulic machines in use, in 1800, the time at which the inventor was preparing his new discovery, appeared to him to be too expensive or too complicated, and economy being his object, he discarded pumps and wheels moved by water, steam, or animal strength: nature alone, stript of an useless apparatus of mechanical encumbrances, was consulted

HYDRAULIC RAM



by him; he studied her laws and obtained what he wanted.

Experience demonstrates, that a body placed at a small distance from the surface of the earth, and following without impediment the laws of gravitation, falls with a quickness increasing in the proportion of 30 feet in a second. The result is that the quickness of those bodies increases as their time and the distance described by them is as the square of their time. But if the fall of the same body is not free; that is to say, if it communicates a portion of its motion to other bodies in a state of rest, the quickness, as well as the distance described, diminish in proportion to the masses with which it has divided its motion. In pursuance of these two incontestible facts, Montgolfier, satisfied that the strength vested in a body cannot be destroyed, conceived the idea of raising, by the means of a given fall of water, a portion of that water to an indefinite height; proportioned, as to its quantity, to the elevation of their ascension, divided by the elevation of the fall, allowing for some loss occasioned by friction.—Supposing accordingly, that, in the figure annexed, corresponding with the model, the column A, 5 feet high, represents the fall of water which the local situation of the stream or brook has enabled to obtain, and that the conduit, or pipe B, is 15 feet long, the vertical column A, shall be called *active*, and the horizontal column B, in the said conduit or pipe, shall be called *passive*. Supposing also that the tube of ascension is prolonged to the elevation of 100 feet, where the bason intended to receive the water is

placed, and that an air reservoir is provided for inside of the balloon D. It will happen that if a sufficient quantity of water is poured into the superior bason to fill up the tube of ascension F I, the air contained in the reservoir or balloon D, shall be reduced to occupy less than one-fourth of the space which it occupied before its compression, and that the rest of the space shall be occupied by the water descended through the tube of ascension F I, and that the elasticity of the compressed air being equipoised by the pressure of the column of water, the whole shall remain in a perfect state of rest. Now, admitting that the two valves, to wit, the stopping valve C, and the ascending valve O, are shut up, it will follow of course, that the two columns, A and B, shall also be in a state of rest, and such will be the situation of the ram whenever it is not in action. But in order to rouse it from that state of stupor, if the valve C is abandoned to her own weight, it will descend into the water until the extremity of the stem running through it touches the base of the tube B. At that moment the active column A will begin to obey to her own force of gravitation, but not in a complete state of freedom, being prevented by the stupor of the passive column, which will divide her movement, so that the two columns will acquire an equal quickness. But inasmuch as the active column is but one third of the passive column, the said quickness shall not be more, after a given time, than the fourth of the quickness that the active column should have acquired, during the same time, had it been suffered to use freely its own gravity.

By the constant pressure of the air compressed in the air reservoir D, through the action of the two columns A and B, and by the constant re-action of the same mass of air on the same columns, the whole operation of the hydraulic ram is performed.

The practical application of that simple machine is very extensive; manufacture, agriculture, domestic accommodation and hydraulic architecture, may equally be benefited by it, and no machine offers greater *results*, with less expense.

In order to understand what is meant by the *result* of an hydraulic machine, it must be stated, that it is the produce of water raised in proportion to the power of water used to raise it. According to that definition, the most celebrated machines, such as the machine of Marly, erected at an enormous expense by Louis the XIVth, to convey water from the river Seine to his residence at Versailles, has in its primary establishment yielded only $\frac{1}{40}$ and latterly only $\frac{1}{200}$. Other machines have not offered more satisfactory results; but a well executed ram generally yields about $\frac{1}{30}$ of the power it uses, and accordingly its produce it greater than the produce of common hydraulic machines placed in the same circumstances. That instrument will prove to be of the greatest utility for agricultural purposes, and particularly for the irrigation of land. It may also be used with advantage in hydraulic architecture, to restore to canals a certain proportion of the water lost by the waste of the locks and evaporation, or to supply water to those destitute of sufficient feeders. Several cities might equally with the assistance

of that valuable machine, receive from adjoining rivers or streams, water of a good quality for culinary, domestic, or manufacturing purposes.

The expense will vary according to circumstances; but it may generally be said that it will be in proportion, 1st, of the quantity of water required; 2d, of the pitch of ascension; 3d, of the distance of the reservoir where it is to be carried, and that, finally, the greater the fall the cheaper it will be.

The following example, stated by Montgolfier in one of his memoirs, will give, on the expense attending the establishment of an hydraulic ram, a basis upon which comparative calculation may be made.

"It was requisite to elevate to 108 feet the greatest possible quantity of water, with a fall of only 5 feet 9 inches. A ram 4 inches diameter was applied, which employed daily 11,500 cubic feet of water, and delivered during the same time 240 cubic feet of water. The ram properly so called had cost in Paris 2400 livres, and all the accessaries and fixing amounted to as much, so that for 4800 livres (about 1000 dollars) at 108 feet elevation, a quantity of water has been raised amply sufficient for all the wants of a large family, the irrigation of an extensive garden, and the supply of a considerable stock of cattle and horses, &c."

The keeping of the machine is trifling, and requires nothing but cleaning after a freshet or a frost. It must be observed that the utility of the hydraulic ram is not confined to running water, and that by the construction of an artificial fall, it may be applied to draw water from low repositories or to drain

mines and deposits of stagnant waters, with as much facility as it is practised by the means of wheels, pumps, &c. and for these purposes the simplicity of the ram, will render it preferable to any other hydraulic machine.

Description of a Dumb-Stove.

By SIMEON DE WITT, Esq.

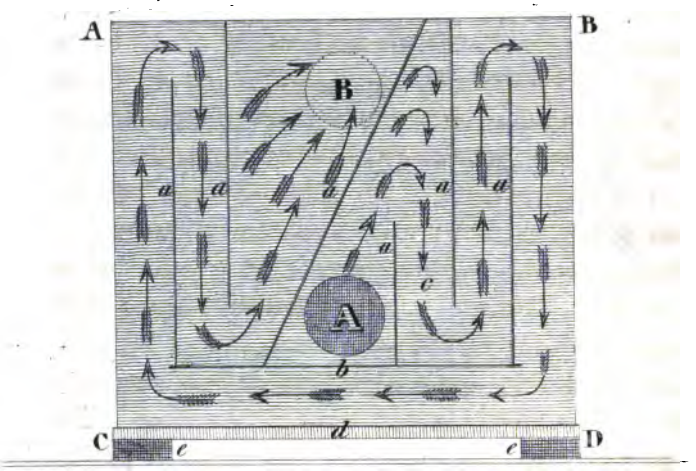
(With an Engraving.)

Communicated, Nov. 30, 1819.

DUMB-STOVES have been long in use, and where they can be conveniently placed, prove very useful in regard both to comfort and economy; but they are generally made of such a shape as to be unpleasant in appearance as well as inconvenient on account of the room they must occupy. With a view to remedy these defects, I have constructed one, which I have now in use in my house, of the following description:

The stove is 36 inches long, 33 inches wide and 7 inches thick. The sides, ends and top are sheets of iron, in the shape of parallelograms, joined together in the usual manner. The bottom is left open, and is set on a pan or sheet of iron with about an inch of its edge all round turned up so as to embrace the lower edges of the stove. Fig. 1, is a perpendicular longitudinal section of the stove. A is the place where the pipe that communicates the heat enters in front, and B the place where the pipe in the rear is inserted to carry the smoke to the chimney. a, a, a, a, a, a, are partitions rivetted to the front and back of the stove, and b is a moveable partition, supported at such a height as to join on the lower ends of the two inside and the two outside fixed partitions. The supporters are made of strips of sheet iron, bent as represented at C, and rivetted

Fig. 1



DUMB STOVE

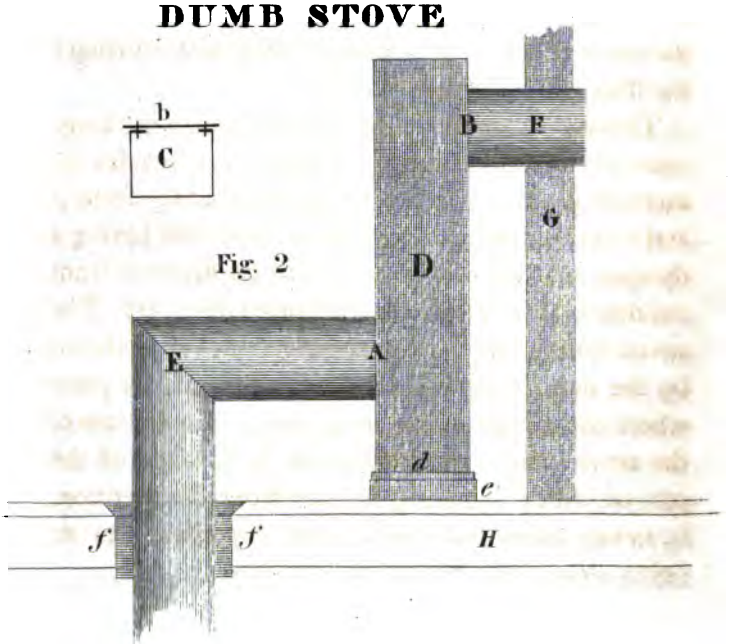


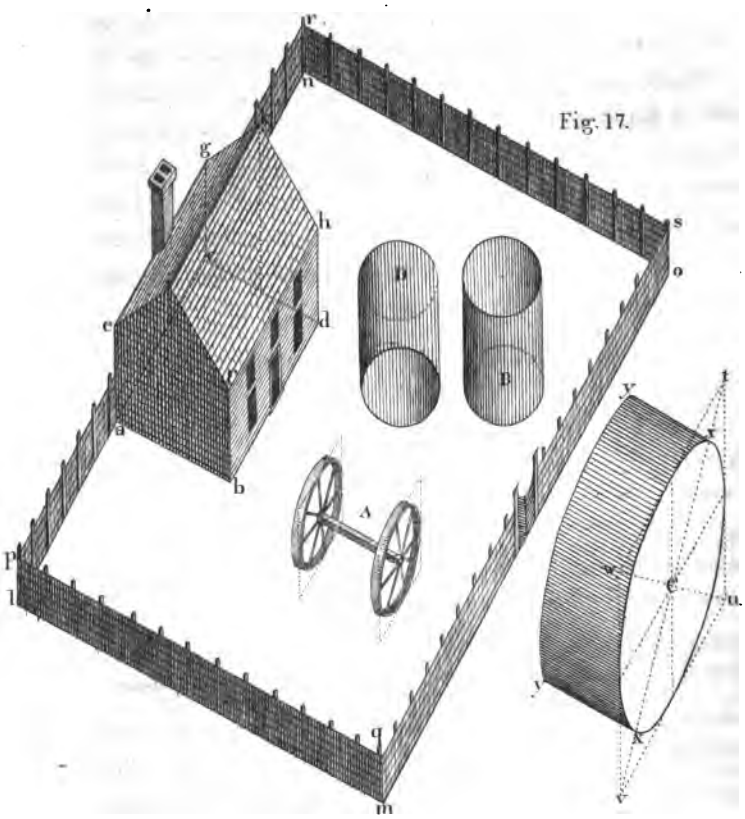
Fig. 2

to this partition—one near each end and one in the inside will be sufficient. d, is the view of the pan in which the stove is set, and e, e, are bricks by which it is supported. Fig. 2, is a perpendicular transverse section. D, the body of the stove; E, the pipe conveying the heat to it; and F, the pipe to carry off the smoke; it passes through a four-inch brick wall, G, built temporarily to shut up the fire-place. f, f, is a curb made of two tubes of sheet iron, the one within the other, with a space of about two inches between them, and joined to each other at the bottom. The inner one is of a diameter just sufficient to let the pipe E pass through it. The outside one has its upper edge bent outwards so as to fit a bevelling hole cut through the floor. The space between the two conjoined tubes is packed with clay or common earth, to serve as a non-conductor of the heat, which might otherwise endanger the floor or ceiling H below it.

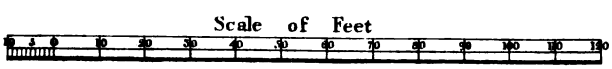
This dumb-stove receives its heat from a cooking-stove in the kitchen below it, which has, besides the ascending pipe, one branching horizontally from it and entering the kitchen chimney, and each having a damper, that the heat may thereby be diverted from the dumb-stove whenever it becomes necessary. The revolutions of the heat in the dumb stove are shewn by the darts from its entrance at A to B, the place where the smoke makes its escape. The bottom of the stove being open, whenever it is taken off the pan on which it stands, and the moveable partition, b, being taken out, there is no impediment to its being cleaned as often as is necessary.

From this description it will be seen, that this dumb-stove has great advantages which those heretofore in use do not possess. It has nothing objectionable in its appearance; its structure is such as to give out the greatest quantity of heat that can be obtained from any, and it occasions little inconvenience from the room it occupies. By the ordinary use of the stove below by which the cooking of the family is chiefly done during winter, a sufficient warmth is communicated through this dumb-stove to the room above to make it perfectly comfortable in the coldest weather.

Military Perspective



Scale of Feet



SELECTED PAPERS.

The following is, by permission of the author, taken from the concluding part of DE WITT's *Elements of Perspective.** As directions for this simple and highly useful method of drawing are rarely to be found in books, it was considered as a proper addition to the materials selected for publication, from the communications made to the Society.

MILITARY PERSPECTIVE.

(With Engravings.)

THIS is a peculiar kind of perspective which deserves attention, though seldom noticed in treatises of this nature. It does not indeed represent things exactly as they appear to the eye, but is better cal-

* The Analectic Magazine for the month of June, 1814, in noticing this work, says, "The fundamental rules of this art are laid down in it with clearness and simplicity, in a series of neat propositions, and a number of appropriate examples of its practice are given. This work contains as much of the principles of perspective as are absolutely essential. It comprises in a small compass almost every thing that is usually recollected, after the toilsome study of larger works, and has the advantage, from its author being evidently well acquainted with the useful application of the art, of being free from such propositions as are merely objects of curiosity, and of others which are, when tested by use, absolutely false, of which we have seen several in a late work on the subject." ********** "The chapter of MILITARY PERSPECTIVE is well drawn up, and should it be adopted in our military academies, will probably revive among us a mode of military plan, drawing, which, although now almost forgotten throughout the world, needs no other recommendation than its having been that which was practised by De Ville, Vauban, and all the other ancient masters of the art of the attack and defence of fortified places."

culated, than any other method of drawing, to give true ideas of the positions and proportions of objects. It is a species of orthographic, called *Military Perspective;* because it has been most advantageously employed to represent fortifications, with their various structures, and especially fortified towns. Formerly it was more common than it is now, and the reason why it is so much neglected at present, I believe to be, that it is considered as having been used only by those who were ignorant of the general rules of perspective. The fact, however, is otherwise. It was chosen as the best kind, founded on scientific principles, for the purposes to which it was applied.

The principles of military perspective, are these, which, together with the practical rules deducible from them, will be perfectly understood from a bare statement.

The fundamental plane is horizontal; the plane of the picture perpendicular, and the eye is supposed to be in front of it, elevated to an angle of 45 degrees, and at an infinite distance from it; whence it follows, that all lines drawn from objects to the eye, will be parallel to each other, and make vertical angles of 45 degrees with the plane of the picture, as well as with the fundamental plane; and hence it further follows, that all figures parallel to the fundamental plane, or to the plane of the picture, will be represented by equal and similar figures, and all horizontal and perpendicular lines will be represented by lines bearing the same proportion to each other, and may, therefore, in the drawing, be measured by a scale.

A single example will be sufficient to teach this method of drawing.

Let it be required to represent a house 40 by 28 feet, the elevation of the front 20 feet, and the ridge of the roof 35 feet high, with a court yard 128 by 90 feet, inclosed by a fence of posts 10 feet high, and 7 feet apart from each other.

FIGURE 17.

Draw the ground plot of the house and yard by a scale of equal parts. Let a, b, c, d, be the plot of the house, from the corners of which raise the perpendiculars, ae, bf, cg, dh, each 20 feet high; from the middle of ab and cd, raise perpendiculars to i and k, 35 feet, and draw the connecting lines as in the figure: The house will then be represented in military perspective; to which, by the same rules, may be added doors, windows, chimnies, &c. Next divide the sides of the plot of the court-yard into parts of 7 feet, and on the several divisions raise perpendiculars of 10 feet for the posts. Add rails, gates, &c. and give a proper shading to the whole.

To represent circles: first draw the perspectives of the circumscribing squares by the preceding directions, and then draw in them, by the eye, the representations of the circles, touching the sides of the squares at their middle divisions, and intersecting the diagonals at seven tenths of the distance from the center to their ends, as exemplified at A; which shows a pair of vertical wheels, standing parallel to the fence of the court-yard, or more distinctly at C, where t, u, v, w, is the perspective of the square cir-

cumscribing the circle. If C be the end of the cylinder, the sides as Xy, will be at right angles to u v and t w.

The perspectives of horizontal circles and circles parallel to the plane of the picture, will be circles, as shewn by the ends of the upright cylinder B, and horizontal cylinder D.

If a drawing of this kind be placed against a wall, and viewed at some distance from above, under an angle of 45 degrees, it will exhibit nearly a true appearance of the objects represented; or if the drawing be laid on a table, at some distance before you, and viewed in that manner under an angle of 45 degrees, the appearance will be the same; because, if in making the drawing, the plane of the picture had been supposed horizontal instead of perpendicular, there would be no difference in the result. If you look, in either case, through a small aperture, confining the view exclusively to the drawing, the appearance will strike as a still more perfect resemblance of the objects.

This method of drawing will be found particularly useful for showing the shapes, as well as situations, of buildings, on maps of farms or of gentlemen's country seats, and also public edifices of diversified parts, so situated that they cannot be seen from the points of view usually taken in ordinary perspective. I think it will also be found the most eligible for drawings, and ought therefore to be preferred in applications to accompany the description of machines, for patents, or communications for public information; an example of which may be seen in the description of the diorascope, figure 15.

The circumstances which, in the estimation of some, may lessen the merits of this species of perspective, will, in the opinion of others, and I think justly, enhance it: They are its simplicity, the facility with which a perfect knowledge of it may be acquired, and the little trouble that attends the practice of it. Nor can its inelegance be alledged against it. I have met with some beautiful specimens of it. There is now before me a superb work, in the Dutch language, printed in 1760, giving a description of Amsterdam; illustrated by a great variety of the finest copperplate prints, and among them, several in military perspective; one of which represents the celebrated BEURS or *Exchange* of that city, and gives an idea of it more perfect than could possibly be given by drawings of any other kind.

It must, however, be confessed, that in too many instances there are evidences of a want of acquaintance with the rules of this species of drawing.

There are two other species of orthographic perspective which it may not be improper to mention. One supposes the eye at an infinite distance, looking horizontally at objects, through the plane of the picture, placed perpendicular to the horizon. This is that by which architects draw the *elevations* of buildings, and may therefore be called ARCHITECTURAL PERSPECTIVE.

The other supposes the plane of the picture parallel to the horizon, and the eye at an infinite distance perpendicularly above it: This is generally called the BIRDS-EYE-VIEW, and is that by which charts

or maps commonly shew the shape of the surface of the earth: Although not warranted by precedent, I shall venture to call this GEOGRAPHIC PERSPECTIVE.

The objects drawn in the examples given for illustrating the rules of perspective, have been chosen as the simplest that could be devised, composed of lines placed in every position, horizontal, inclining, declining, perpendicular and parallel to the *plane of the picture*. They furnish, therefore, sufficient samples for the drawing of objects of every possible shape. More would have needlessly swelled the size of the book.

A Description of a Process, by which CORN *tainted with Must may be completely purified.*

By CHARLES HATCHETT, Esq. F. R. S.

From the Philosophical Transactions of the Royal Society of London.

THE very great loss which this country formerly experienced by a considerable part of imported grain having been contaminated by must, induced me, several years past, to direct my attention towards discovering some simple and economical method by which this taint could be removed, and you well know that my endeavours were successful; but as circumstances at that time, and since, did not appear to require that great publicity should be given to this process, I contented myself with describing it to you and a few of my other friends. Now, however, when I reflect on the large quantities of corn which, during the last harvest, have been housed in a damp state, and on the great importations which are expected, with the extreme probability that a considerable part may have contracted must, and that thus the object of importation may be partially frustrated by the destruction of a large portion of grain, and the consequent increase in the price of the remainder, I think it incumbent on me to lose no time in publishing a process by which corn, however musty, may be completely purified, with scarcely any loss of quantity, with very little expense, and without requiring previous chemical knowledge or chemical apparatus.

The experiments which I made were confined to wheat, as being of the greatest importance; but there can be no doubt that oats and other grain may be restored to sweetness with equal success; and I have also additional satisfaction from being enabled to state, that the efficacy of the process may be ascertained by any person, in any place, and upon any quantity of grain, however small.

From my experiments I am inclined to believe, that must is a taint produced by damp upon the amylaceous part of the grain or starch; that the portion of starch nearest to the husk is that which is first tainted; and that the greater or less degree of must is in proportion to the taint having penetrated more or less into the substance of the grain. In most cases, however, the taint is only superficial; but, nevertheless, if not removed, it is sufficient to contaminate the odour and flavour of the whole, especially when converted into flour.

After various experiments, I found the following method to be attended with success.

The wheat must be put into any convenient vessel capable of containing at least three times the quantity, and the vessel must be subsequently filled with boiling water; the grain should then be occasionally stirred, and the hollow and decayed grains (which will float) may be removed; when the water has become cold, or in general when about half an hour has elapsed, it is to be drawn off. It will be proper then to rince the corn with cold water, in order to remove any portion of the water which had taken up the must; after which the corn being com-

pletely drained, is without loss of time to be thinly spread on the floor of a kiln, and thoroughly dried, care being taken to stir and to turn it frequently during this part of the process.

This is all that is required; and I have constantly found that even the most musty corn (on which ordinary kiln drying had been tried without effect) thus became completely purified, whilst the diminution of weight caused by the solution of the tainted part was very inconsiderable.

On Preventing the Mildew on Peach Trees.

By James Kirk, *Gardner at Smeaton.*

From the Transactions of the Caledonian Horticultural Society.

I beg leave to submit the following observations, to the Horticultural Society, on the mildew upon peach trees.

For more than nine years I have not had a mildewed leaf on any of the numerous peach trees that are in the garden of the honourable Mr. Baron Hepburn, at Smeaton, either in the hot-houses or upon the open wall.

I ascribe this exemption from mildew to my mode of management; which is this: In the months of January and February, if I see any of the trees in a stunted or sickly state, I take away all the old mould from the roots as carefully as possible, and put in its place fresh rotten turf from an old pasture, without any dung. This I have done in many instances; and all the times that I have practised it the trees have never failed, not only completely to recover their health, but to produce a crop of fine swelled fruit.

On the Preservation of Fruits during Winter and Spring.

By Mr. T. A. Knight.

From the Transactions of the Horticultural Society.

THE art of preserving fruits for the desert in winter and spring appears to be better understood, or at least to be practised with better success, by the gardeners of the continent, than by those of the British Islands; and it becomes a very interesting subject of enquiry, whether the superior success of the continental gardeners be dependent upon the superior qualities of their fruits, or upon the influence of a less humid atmosphere during winter; or upon some peculiarities of management.

Fruits which have grown upon standard trees, in climates sufficiently warm and favourable to bring them to maturity, are generally more firm in their texture, and more saccharine, and therefore more capable of being long preserved sound, than such as have been produced by wall-trees; and a dry and warm atmosphere also operates very favourably to the preservation of fruits under certain circumstances; but under other circumstances, very injuriously; for the action of those elective attractions, which occasion the decay and decomposition of fruits, is suspended by the operation of different causes in different fruits; and even in the same fruit, in different states of maturity. When a grape is growing upon the vine, and till it has attained perfect ma-

turity, it is obviously a living body, and its preservation dependent upon the powers of life; but when the same fruit has some time passed its state of perfect maturity, and has begun to shrivel, the powers of life are probably no longer, or at most very feebly, in action; and the fruit appears to be then preserved by the combined operation of its cellular texture, the anti-septic powers of the saccharine matter it contains, and by the exclusion of air by its external skin; for if that be destroyed, it immediately perishes. If longer retained in a dry and warm temperature, the grape becomes gradually converted into a raisin; and its component parts are then held in combination by the ordinary laws only of chemistry.

A nonpariel apple, or a catillac, an auch, or bergamotte de bugi pear, exhibits all the characters of a living vegetable body long after it has been taken from the tree, and appears to possess all the powers of other similar vegetable bodies, except that of growing, or vitally uniting to itself other matter; and the experiments, which I shall proceed to state, prove that the pear is operated upon by external causes nearly in the same manner after it has been detached from the tree as when it remains vitally united to it.

Most of the fine French pears, particularly the auch, are much subject, when cultivated in a cold and unfavourable climate, to crack before they become full grown upon the trees, and consequently to decay before their proper season, or state of maturity; and those which present these defects in my

garden are therefore always taken immediately from the trees to a vinery, in which a small fire is constantly kept in winter, and they are there placed at a small distance over its flue. Thus circumstanced, a part of my crop of such pears ripen, and will perish if not used in November, when the remainder continue sound and firm till March or April, or later; and the same warm temperature which preserves the grape in a slightly shrivelled state till January, rapidly accelerates the maturity, and consequent decay, of the pear. By gathering a part of my swan's egg pears early in the season, (selecting such as are most advanced towards maturity,) and subjecting them, in the manner above mentioned, to artificial heat, and by retarding the maturity of the later part of the produce of the same trees, I have often had that fruit upon my table nearly in an equal state of perfection from the end of October to the beginning of February; but the most perfect in every respect have been those which have been exposed in the vinery to light and artificial heat as soon as gathered.

The most successful method of preserving pears and apples which I have hitherto tried has been placing them in glazed earthen vessels, each containing about a gallon, (called provincially *steens*,) and surrounding each fruit with paper; but it is probable that the chaff of oats, if free from moisture or any offensive smell, might be used with advantage instead of paper, and with much less expense or trouble. These vessels being perfect cylinders, about a foot each in height, stand very conveniently upon each other, and thus present the means of pre-

serving a large quantity of fruit in a very small room; and if the spaces between the top of one vessel and the base of another, be filled with a cement composed of two parts of the curd of skimmed milk and one of lime, by which the air will be excluded, the later kinds of apples and pears will be preserved with little change in their appearance, and without any danger of decay, from October till February and March. A dry and cold situation, in which there is little change of temperature, is the best for the vessels; but I have found the merit of the pears to be greatly increased by their being taken from the vessels about ten days before they were wanted for use, and being kept in a warm room; for warmth at this, as at other periods, accelerates the maturity of the pear. The same agent accelerates its decay also; and a warmer climate cannot contribute to the superior success of the French gardeners, which probably arises only from the circumstance of their fruit being the produce of standard, or espalier trees.

I have in a former communication given an opinion, that good varieties of hardy winter pears, which will succeed without the protection of walls, may be easily obtained by propagating from the seeds of the best and hardiest varieties of winter pears that we now possess, and the pollen of the best French pears; and I have subsequently raised several hundred seedling plants, which, by their foilage and general character, promise the most ample success. Many years must however elapse, probably more than I shall live to see, before the greater part of these will

produce fruit; but I trust that the plants will not be neglected by those to whose care I shall entrust them, and that the produce of some of them will be hereafter honoured by the approbation of the Horticultural Society.

On preventing the Depredations of the Turnip-Fly.

By Mr. Archibald Gorrie, *Rait Garden.*

From the Transactions of the Caledonian Horticultural Society.

IN the month of March 1810, I had a sowing of early Dutch turnips above ground, on a south border, soil strong black loam. About the 20th, I observed some of the flies begin to attack them, and in a few days they all disappeared. To prevent this happening to the next sowing, I steeped the seeds two days previous to sowing, in a strong ley mixed with sulphur. About the middle of April, this sowing began to rise, and the seminal leaves were fully expanded in two days, when they likewise began to disappear. The next sowing without sulphur, was above ground about the latter end of April; and this, I endeavoured to preserve, by sowing a little soot along the drills; at the same time, I dusted over some rows with coal-ashes, river sand, and road dust, two rows with each. I was surprised to see the fly devouring the turnips dusted with soot so voraciously, that few of them stood one day, and what remained were totally dispatched next morning, although none were burnt by the soot, it being laid on quite thin. The next that gave way were those covered with ashes; and lastly, those covered with sand, became a prey to destructive insects.

After a number of other unsuccessful experiments, I tried how quicklime might defend the young turnips from their merciless devourers. I

dusted over a few rows with it; and it was washed off about a week after, when I found the turnips uncommonly fresh and green, although they had been almost devoured previous to my applying the lime-dust. I then went on with confidence, dusting all my young turnips the moment I perceived the fly begin to threaten them. Leaving a few rows undusted, to prove the experiment, I found those I left undusted go off rapidly.

I was doubtful that my success was in some measure owing to the advanced state of the season, and the consequent rapid progress of vegetation, but from repeated trials made in the early part of this season with uniform success, I am confirmed in the opinion, that quicklime dusted over the seminal leaves of young turnips, is both an easy and effectual method for preventing the depredations of the turnip-fly. A bushel of quicklime is sufficient to dust over an acre of drilled turnips; and a boy may soon be taught to lay it on almost as fast as he could walk along the drills. If the seminal leaves are powdered in the slightest degree, it is sufficient, but should rain wash the lime off before the turnips are in the rough leaf, it may be necessary to repeat the operation, if the fly begin to make its appearance.

REMARKS

On the present Mode of Budding and Grafting Fruit Trees.

By Mr. JOHN WILMOT, of Isleworth.

From the Transactions of the Horticultural Society of London.

THE good old way of grafting and budding fruit trees, was to do this upon a stem or stock several feet in height; and it is by this mode of raising trees that we now see so many beautiful and flourishing orchards. But this will, I very much fear, be looked for in vain by those who are to come after us, if a stop is not speedily put to the method followed at present. They are grafted and budded upon stocks but a few inches high; and this practice, (although it certainly answers the purpose of promoting a quick supply of plants,) if it be well considered, will be productive of the greatest mischief. The nurseryman in working the standard fruit tree from the bottom of the stock, is not only injuring the individual who plants, but does irreparable injury to the public. Trees thus worked, I am well assured, will, in the ordinary course of things, last but a few years. This I perceive must be particularly the case with trees planted in a garden, where frequent manurings are continually adding to the soil, so that in a few years it becomes raised above the budded part. In this case the whole of the wild stock becomes buried, and it is by that means deprived of the genial influence of the sun and of the atmosphere; and being thus abridged of the nourishment and refreshings which nature intended for it, it begins to decline in vigour and soon

after decays and perishes. This I have frequently observed in my own experience, and hence it is that trees are continually decaying, and such frequent supplies of them are required.

It ought also to be considered, for it is in my opinion a matter of great importance, that by the practice I deprecate, fruit trees are exposed to much greater danger through external injuries than they otherwise would be. It is notorious, that the bearing stem (especially of peaches, nectarines, and apricots) is much more tender, and therefore much more liable to be injured than the wild stock; and, if injured, is by no means so likely to be so soon and effectually healed. Every man of observation knows, that the wild stock will bear, without material injury, wounds and bruises, which would occasion to the other a rapid and incurable decline. As therefore, by this new method, the whole, or almost the whole, of the stem of the tree is of this tender nature, and by the old method the whole of the stem was of the hardiest wild stock, it is evident, that trees, as they are now raised, are exposed to perpetual injuries from the spade, cattle, insects, &c. which they would not be if the old method of working from the top were to be restored. Arguments need not, I conceive, be multiplied to prove that nature in its wild state is much more able to bear injuries with impunity than it is in a state of cultivation, and that the latter often become a prey to gum, canker, &c. which produce a gradual decline, from causes which would do none, or a very trifling injury to the wild stock.

AN ESSAY

On the Management of Bees, with an Account of some curious Facts in their History.

By Dr. James Howison, *of Hillend.*

(With Engravings.)

From the Transactions of the Caledonian Horticultural Society.

IT being my intention to describe to the Society the management of a single hive of bees, from their swarming until they themselves have sent forth their first colony, I shall remark on the different operations, as they naturally succeed each other, according to the method now in general use; leaving that followed by me, of taking the honey without killing the bees, to be explained under a distinct head.

Variety of Bees. To the common observer, all working bees, as to external appearance, are nearly the same; but to those who examine them with attention, the differncee in size is very distinguishable; and they are in their vicious and gentle, indolent and active natures, essentially different.

Of the stock which I had in 1810, it required 250 to weigh an ounce; but they were so vicious and lazy, that I changed it for a smaller variety, which possesses much better dispositions, and of which it requires 296, on an average, to weigh an ounce. Whether size and disposition are invariably connected, I have not yet had sufficient experience to determine.

Materials and size of Hives. Hives made of

straw, as now in use, have a great advantage over those made of wood or other materials, from the effectual defence they afford against the extremes of heat in summer and cold in winter. That the hives in size should correspond as nearly as possible with that of the swarms, has not had that attention paid to it which the subject demands, as much of the success is the management of bees depends on that circumstance.

From blind instinct, bees endeavour to fill with combs whatever hive they are put into, before they begin to gather honey. Owing to this, when the hive is too large for its inhabitants, the time for collecting their winter store is spent in unprofitable labour: and starvation is the consequence. This evil also extends to occasioning late swarming the next summer; it being long before the hive becomes so filled with young bees as to produce a necessity for emigration, from which cause the season is too far advanced for the young colonies to procure a winter stock.

I should consider it a good rule in all cases, that the swarm should fill two-thirds of the hive. The hives used by me for my largest swarms, weighing from five to six pounds, will contain two pecks measure of corn, and will yield in a good season, eight Scots pints of honey, and for smaller swarms, in proportion. Hives with empty combs are highly valuable for second swarms, as the bees are thereby enabled much sooner to begin collecting honey.

Situation for Hives. That the hives should be so placed as to receive the rays of the rising as well

as meridian sun, is of considerable importance, heat and light appearing the principal stimulants to the bees. A hive so situated as not to be touched by the sun until some hours later than the other hives in the same garden, would in the course of the season lose a proportional number of days labour. Hives should stand at some distance from walls and hedges. When lately building a garden wall, with a good exposure for bees, I ordered a number nitches to be made, into which I afterwards put hives. These were, however, so much infested with snails in summer, and mice in winter, that I was under the necessity of removing them to a more open situation.

Feeding of Bees. Near the sea little honey is collected after the first week in August; but in high situations, where the flowers are later, and heath abounds, the bees labour with advantage until the middle of September. These are the proper periods, according to situation, for ascertaining if the hives intended to be kept contain a sufficient winter stock. The killing of the drones (a very singular fact in the history of the bee, and which will be noticed hereafter,) perhaps marks this time with more precision.

If a large hive does not weigh, thirty pounds, it will be necessary to allow it half a pound of honey, or the same quantity of soft sugar made into a syrup, for every pound that is deficient of that weight; and, in like proportion, to smaller hives. This work must not be delayed, that time may be given for the bees to make the deposit in their empty cells before they are rendered torpid by the cold.

I must here notice, that sugar simply dissolved in water (which is a common practice,) and sugar boiled with water into a syrup, form compounds very differently suited for the winter store of bees. When the former is wanted for their immediate nourishment, as in spring, it will answer equally as syrup; but if it be laid up as store, the heat of the hive quickly evaporating the water leaves the sugar in dry crystals, not to be acted upon by the trunks of the bees. I have known several instances of hives killed by hunger, while some pounds weight of sugar in this state remained in their cells. The boiling of sugar into syrup forms a closer combination with the water, by which it is prevented from flying off, and a consistence resembling that of honey retained. I have had frequent experience of hives not containing a pound of honey preserved in perfect health through the winter, with sugar so prepared, when given in proper time, and in sufficient quantity.

Covering the Hives. Bees are evidently natives of a warm climate, a high temperature being absolutely necessary to their existence; and their continuing to live in hollow trees during the severe winters of Russia and America must depend on the heat produced from the great size of the swarms which inhabit these abodes. From my own observation, the hives which are best covered during winter, always prosper most the following summer. In consequence about the end of harvest, I add to the thin covering of straw put on the hives at the time of swarming a thick coat, and shut up the aperture through which the bees entered, so that

only one can pass at a time. Indeed, as a very small portion of air is necessary for bees in their torpid state, it were better, during severe frosts, to be entirely shut up, as numbers of them are often lost from being enticed to quit the hive by the sunshine of a winter day. It will, however, be proper at times to remove, by a crooked wire or similar instrument, the dead bees and other filth, which the living at this season are unable to perform of themselves.

To hives whose stock of honey was sufficient for their maintenance, or those to which a proper quantity of sugar had been given for that purpose, no farther attention will be necessary, until the breeding season arrives. This, in warm situations, generally takes place about the beginning of May, and in cold about a month after.

Owners of hives are often astonished, that at this advanced season, when their bees had, for weeks preceding, put on the most promising appearance, after a few days of rain, they became so weak and sickly as to be unable to leave the hive, and continue declining until they at last die.

From paying attention to this subject, I am convinced that the cause is as follows. The young bees, for a short time previous to their leaving their cells, and some time after, require being fed with the same regularity that young birds are by their parents; and if the store in the hive be exhausted, and the weather such as not to admit of the working bees going abroad to collect food in sufficient quantity for themselves and their brood, the powerful

principle of affection for their young, compels them to part with what is not enough for their support, at the expense of their own lives.

To prevent such accidents, I make it a rule, that if, during the breeding season, it rain for two successive days, to feed all the bees indiscriminately, as it would be difficult to ascertain those only who require it.

Of Swarming. For several years past, my hives have uniformly sent forth their first swarms during the second week in July, from which it appears, that early or late swarming *in the same situations* is not so much regulated by good or bad seasons, as might have been expected. Near the sea, this will of course, take place some weeks earlier.

The first swarming is so long preceded by the appearance of drones, and hanging out of working bees that if the time of their leaving the hive is not observed, it must be owing to want of care. The signs of the second are however more equivocal, the most certain being that of the queen, a day or two before swarming, at intervals, of a few minutes, giving out a sound a good deal resembling that of a cricket. It frequently happens, that the swarm will leave the old hive, and return again several times, which is always owing to the queen not having accompanied them, or from having dropt on the ground, being too young to fly to a distance. In such cases, I have seen her found near to the old hive, and on being taken up and placed in the new one, the swarm instantly settled.

Gooseberry or currant bushes should be planted

at a short distance from the hives, for the bees to swarm upon, as by attending to this, I have not lost a swarm by straying for several years. This, I am, however, convineed, depends much on the nature of the bees which form the stock. When a hive yields more than two swarms, these should uniformly be joined to others that are weak, as from the lateness of the season, and deficeincy in number, they will otherwise perish. This junction is easily formed, by inverting at night the hive in which they are, and placing over it the one you intend them to enter. They soon ascend, and apparently with no opposition from the former possessors, as I have never observed fighting to be a consequence.

It being very universally believed, that two queens cannot live together in the same hive, I have for several days after this forced junction, searched for the murdered queen, but never with success. Should the weather, for some days after swarming, be unfavourable for the bees going out, they must be fed with care until it clears up, otherwise the young swarm will run a great risk of dying.

Method of obtaining the Honey without killing the Bees. The Society will see, from the peculiar structure of the hive, with which I accomplish this object, that I was under the necessity of making it of wood, in place of straw, which, for the reasons before given, I should have preferred.

It consists of two distinct hexagons, one placed above the other. The under is formed of six panes of half-inch deal, each measuring ten inches in

width, and eight in depth, and covered with a thin board at top. This forms a box that will contain two pecks measure of corn, and which, I consider, as sufficient for the largest swarm. This is intended for the breeding as well as winter habitation of the bees. The upper is of the same dimensions and form as the under at bottom, but in order to give it a conical shape, for the more conveniently fixing thereon a coat of straw, the panes at top are only five inches wide, which is also covered by a piece of board. The upper box has a moulding fixed to its under part, which projects about a quarter of an inch, and so exactly embraces the upper part of the lower box, as to join these two firmly together. In the deal which forms the top of the lower box, are cut four oval holes, each one inch wide, and two inches long, through which the bees pass into the upper. This communication, when not wanted, is shut by a board, which moves on a nail in its centre. The small pane of glass in the top of the upper box, admits of seeing the progress the bees have made in it, without separating it from the lower one.

When the swarm is first put into the lower box, the communication is not made with the upper until the bees have completely filled the lower with combs. The communication is then to be opened, when the bees will ascend, and if the season is favourable and the swarm numerous, they will fill it also, but not until they have completely stocked the lower. By removing the straw covering, and looking through the glass in the upper box, it may be seen what honey has been collected. Should a part or the whole

of it be wanted, it will only be necessary carefully to separate the upper from the lower box, and shut the board of communication. The upper box is then to be removed to some distance, and the bees contained in it, driven off, on which they will immediately join their companions in the lower. So soon as the honey is taken from the box, it can be replaced, and if early in the season, the communication opened for making more honey; but if late, it must be kept shut until the hive has swarmed next summer. If honey-comb early next season is preferred to a swarm, then the communication must be opened about the beginning of June.

All the honey procured in this way is remarkable for its purity, none of the cells having been ever polluted by the hatching of young bees.

The greatest advantages, however, from this method, are the early and large swarms,—the consequence of not killing the bees.

Conclusion.—I shall conclude this essay, with some curious facts in the history of the bee, which presented themselves to my notice during the management of this singular insect.

1st, I have frequently observed, that during swarming, the twig or branch which supported the swarm, weighing from five to six lb. or 30,000 bees, had its surface completely covered with the first 300 or 400 that alighted upon it, the remainder of the swarm having their whole weight supported by that small number, which, in any other situation, must have torn them to atoms.

2dly, That light is not necessary to the labour of

bees, or if it is, it must be in a degree incomprehensible to us. The passage to the abode of the humble bee, is often a zigzag, several yards in length, through which it appears impossible for any light to pass.

3dly, Bees are entirely directed to their food by smell, as appears from the following experiment. I placed in a tea-kettle a cloth, through which I had strained some honey, and after fixing the lid, I put it on the ground about 200 yards to windward of some hives. I was soon after much amused in seeing a number of bees following the different windings of the scented breeze, until they reached the spout of the kettle, which they immediately entered.

4thly, Killing the drones by the working bees, when the breeding is at an end, is performed in a singular way, and done by one bee in general. It almost uniformly fixes on the drone, at the insertion of the left wing, when it tears with its fangs the muscle which moves the wing, so that when thrown from the stand of the hive, it cannot again rise, and is usually killed by the cold of the following night. No stinging or other violence is ever used; and although the drone is four times the size of his executioner, no attempt at retaliation is ever offered.

Explanation of the Engravings.

Fig. 1, A A, the upper and lower boxes joined, forming the complete hive; *a*, the moulding of the upper box, which fixes it to the lower; *b*, the small pane of glass in the upper box; *c*, its wooden shutter, which moves on a nail.

Fig. 2, A, the lower box inverted; *a a*, the two rows of cross horizontal sticks, for supporting the combs: *b*, the perpendicular stick for the ascent of the bees; *c c c c*, the holes of communication.

Fig. 3, A, the upper box inverted; *a a a*, the single row of cross sticks, for supporting the combs.

On the Cultivation of Asparagus.

By Mr. DANIEL JUDD, *F. S. H. Gardener to* CHARLES CAMPBELL, Esq. *of Edmonton.*

From the Transactions of the London Horticultural Society.

HAVING laid before the members of the Society a specimen of asparagus raised by me, and as it has been pronounced by those who saw it to be the finest they had ever seen, I presume that an account of my method of cultivating it will not be unacceptable to the Society. It is as follows:

I select some of the finest and earliest heads, as they make their appearance in the spring, for seed; these should be tied to stakes during the summer, to keep them upright, for the better ripening of the seed; in doing so, care should be taken not to drive the stake through the crown of the plant, which would injure it for the ensuing season. In autumn, when the seeds are ripe, they should be washed out of the berry, if they are to be sent any distance; but for home sowing I prefer keeping them in the berry till the time of sowing, the pulp being a great nourishment to the seed, which ought to be kept in a dry place during the winter.

The seed should be sown in the month of March or beginning of April, a rich piece of ground being first prepared for the purpose, in drills drawn with a common hoe, deep enough to admit of the seed being buried about an inch and a half below the surface; and these drills, 18 inches apart, to admit of cleaning without damaging the plant. The seeds

should not be sown too thick. If the summer proves dry, a good watering about once a week or fortnight will be of great benefit.

The next season prepare a piece of good land, unincumbered with trees, and that lies well for the sun; give it a good dressing of well reduced horse-dung from 6 to 10 inches thick, all regularly spread over the surface; then proceed with the trenching, (if the soil will permit) two feet deep; after this first trenching, it should lie about a fortnight or three weeks, and then be turned back again, and then again in the same space of time; by this process the dung and mould become well incorporated; it may then be laid in small ridges till the time of planting. The work should all be performed in the best weather the winter will afford, that is, not while it rains, or snow is lying on the ground, as it would tend to make the land heavy and sour; all this is to be particularly attended to, as the preparation of the soil is of more consequence than all the management afterwards. At the time of planting, I always spread over the ground another thin coat of very rotten dung, and point it in half a spade deep, making my beds three feet wide only, with two feet of alleys, so that three rows of grass, one foot apart, are all I plant on each bed; I find this to be the best method; as by this plan there is not the least trouble in gathering, whereas you are obliged to set a foot on one of the wide beds, before you can get at all the grass, to the great injury of the bed and the buds under the surface.

My time of planting is when I observe the plants

are beginning to grow, which is the best time for the plants to succeed; if moved earlier, as it is the practice with most people, they perhaps have to lie torpid for two or three months, which causes many of them to die, or if not, they in general shoot up very weak.

After having got my plants up, I strain the line and cut down a trench, sloping in the usual may for planting box, and make choice of all the finest plants, putting them in, one foot apart, and one inch and a half below the surface; after this is done, I let the alleys and beds lie level till autumn, then dig the alleys out deep enough to get from four to six inches of mould all over the bed, and over this lay a coat of dung, and fill in the alleys with any long dung I can get.

The next season, instead of digging out the alleys, I lay on a coat of good rotten dung, three inches thick, and fork it evenly into the beds and alleys, and so on every season after, never digging out the alleys any more, as it is known the asparagus plant forms a fresh crown every season; and sometimes it happens that in a few years the crown will increase almost into the alley, so that by digging out this, you must inevitably spoil that plant; if this is not the case, when the beds are in good condition, the roots will be sure to work out at the sides into the alleys, and by digging out the latter, these roots must be cut off, and you will often see them exposed all the winter before dung can be got to fill them up; rather than be treated in this way, they had better be without any thing all the winter, as asparagus

does not suffer generally by frost. The first two years I have a very thin crop of celery plants or lettuce upon the beds, but nothing afterwards, nor do I plant any thing in the alleys after the same period, for I think the asparagus is injured thereby.

The third season I begin to cut, but not generally. The fourth and fifth season, the beds are in full bearing, and may be cut from plentifully, but I never make a practice of cutting very much after the first week in June. I then begin to let it run; in fact I never cut the very small grass at all. Asparagus being so valuable a vegetable, some persons continue to cut indiscriminately till the latter end of June; but this practice is of very great injury to the next year's produce. Five beds, as above mentioned, which had been planted five or six years, were very weak when I first had the care of them, but by following the practice above detailed, they are not only improved, but almost equal to any I have now got.

I ought to observe, that I do not desist altogether from cutting, but keep taking what makes its appearance by the side of the standing grass till the latter end of June.

A TREATISE

On the Diseases of Sheep; drawn up from original Communications presented to the Highland Society of Scotland.

By ANDREW DUNCAN, Jun. M. D. F. R. S. E. and A. L. S. L.

From the Prize Essays and Transactions of the Highland Society of Scotland.

IN the year 1803, the Highland Society of Scotland, with the view of collecting information relative to a most important national object, published the following notice:

"A gold medal or piece of plate of forty guineas value, will be given to the person who shall, on or before the 20th of November 1804, lodge with the deputy secretary of this Society the best and approved essay or communication,

"On the accidents and disorders to which sheep are liable, and particularly on those destructive diseases to which, in many situations and seasons, they are incident, called in different parts of Scotland, the one by the name of *braxy*, or *braxit*, or the *sickness*; and the other by that of *rot*, or the *poke*, &c. On the varieties or different kinds of these disorders, the causes inducing them, and the means of preventing, or removing them, in different cases."

To which they subjoined the following judicious note:

"As there is reason to apprehend, that disorders of different sorts are included under each of these

two general names, the Society wish that, so far as may be useful, a description shall be given of the appearances which occur on opening the body of animals afflicted with any of these distempers."

The laudable object of the Society in promulgating this question, was attained in as great a degree as could have been expected. Besides several shorter communications, no less than ten essays of considerable length were transmitted to them, each of which received some mark of the approbation of the Society, although no one of them was so complete in itself, or so superior to the others, as to be deemed worthy of the whole prize. For the same reasons, they resolved not to print one or more of these essays entire in their transactions; but to put the whole into the hands of some professional gentleman, who, by collating them carefully, might arrange the original and valuable information thus collected into one general treatise. With this view, thirteen essays on the diseases of sheep were put into my hands, which the Society had received from the following gentlemen:

1. By Mr. William Hog, of Mension. 2. By the Rev. Mr. Singers, at Kirkpatrick. 3. By Mr. Robert Stevenson, Surgeon, at Gilmerton. 4. By Mr. Alexander Welsh, Easter Harestain. 5. By Mr. Thomas Beattie, Muckledale. 6. By Mr. Walter Scott, Etterick House, Selkirkshire. 7. By Mr. James Hog, Mitchel Slacks. 8. By Mr. William Hog, at Mension. 9. By Mr. Walter Scott, Etterick House, Selkirkshire. 10. By Mr. Alexander Laidlaw, Bourhope. 11. Two short

communications, from Mr. Campbell, of Ormadale. 12. By Mr. James Anderson, of Airsdale. 13. From a gentleman in Northumberland.

Of these materials is the treatise which I now have the honour of presenting to the Society entirely composed. I neither thought it proper, nor did I find it necessary, to consult any other source of information. It therefore does not contain a single fact or observation which is not inserted on the authority of one or more of these essays. In composing it I have preferred that arrangement which appeared to be most natural, not that which was most scientific; and I have endeavoured to render the style popular and perspicuous. But while I have omitted no fact or observation connected with the subject of this treatise, I have rejected from it every speculation, however ingenious, as they would only lessen its value, in proportion as they increased its length. In an appendix, however, I have inserted several important digressions, and various scientific classifications, that nothing might be altogether omitted, by which our knowledge of the diseases to which sheep are liable in this country might be increased, and the means of preventing them rendered more perfect.

Lambing.—The lamb when newly dropt is feeble and defenceless, and in its domesticated state would often perish, but for the fostering care and provident attention of man. Its size, as well as the frequency of twins, is influenced both by the condition of the ewe, and vigour of the ram. A flock which is fed well at rutting time, and which pastures easily,

produces a much larger proportion of twins, than one whose walk is higher and colder, and which feeds more upon heath. Twins are also most frequent in the commencement of the lambing season; the produce of the ram before his vigour is impaired. Hence the propriety of keeping the ewes in good condition, and of not giving a larger number to the ram than he is able properly to serve.

To prevent irregular lambing, the rams must be kept in a strong inclosure, until about the twenty-second of November, when they may be admitted to the old ewes, and some time afterwards, to the gimmers or young ewes; so that the period of gestation being twenty-one weeks, the lambing season may commence about the middle of April. If postponed longer the ewes will not have time to recruit before the approach of winter, and the lambs would not be soon enough ready for the market; while, on the other hand, if admitted sooner, the loss would be very great, both from the severity of the weather, and the want of proper pasture.

When the lambing season approaches, the shepherd must be attentive to keep his flock at home, and prevent others from encroaching on their pasture. If the ground be rough, he must see that none perish in holes or other dangerous places. Immediately before they begin to drop their lambs, Mr. Laidlaw is of opinion that they should be carefully folded, and a small quantity of wool pulled from their udders, to give the lamb more easy access to the teats; but others condemn this practice of udder-locking, as unnecessary and dangerous. Mr. James

Hog mentions an instance, where, in his opinion, it occasioned the death of one twentieth of the ewes, while many of the survivors lambed dead lambs, at the danger of their own lives. "Nature," he adds, "has left a sufficient space bare to enable the young lamb to find the dug, and the uncovering of more serves only to starve them in the most tender parts; for, though I have been engaged amongst sheep all my life, I never saw one lamb die for lack of its dam being udder-locked; nay, let her be as young or as rough as she will: nor did I ever meet with the man who could aver that he had seen any. Whether the Cheviot lambs are easier killed this way, or if owing to the shape of their dams, they are more exposed, I cannot tell, but far less hurt will make that breed lamb dead lambs than the forest breed." When the lambs begin to drop, the greatest attention is absolutely necessary. The ewe being greatly debilitated by the severity of winter, and the pains incident to parturition, will be very apt to go wrong, and die, if neglected. In certain circumstances, she will be unable to lamb without assistance. When any ewe is observed to rise with difficulty, especially if she be dirty about the tail, she must be attended to; and, if necessary, the lamb taken from her with as much skill and tenderness as possible. It is also advisable to place her in a well-sheltered situation, till her recovery be no longer doubtful.

If lambs be healthy, and the weather good, in the course of five, or even two minutes, they begin diligently to search for suck; and after getting it, they seldom perish from cold. But the inclemency of

the weather not unfrequently kills them before they reach the ground. It is, however, less fatal to the lambs of the short black-faced sheep, which have a fleece to cover them, than to others, which are generally naked when dropt; and the loss, from this cause, is in a great measure owing to the want of proper shelter, which should be supplied by planting trees, or at least by building walls in proper situations, to which the shepherd should drive or carry such lambs and ewes as are in danger. He should also carefully observe the point from which the wind is likely to blow, when the storm commences, and conduct his flock to the least exposed situation.

One man is sufficient to attend four hundred ewes, when the season is moderate, and other circumstances are favourable.

For the first fourteen days, lambs depend entirely on milk for their sustenance, although they may be seen nipping the grass, after ten or twelve days.—During this period, they make the most rapid advances towards bulk and strength. They are wanton and playful, and fond of coursing in detached parties round some mound or hillock. But even in this state there are some diseases peculiar to them, of which the most frequent, if disease it can be called, is hunger.

Hunger.—A lamb perishing from hunger is easily known. It appears very hollow at the flanks, has a weak and mournful cry, is very apt to follow any sheep that comes nearest to it, and is either unattended by its mother, or if it attempt to suck her, she springs forward, and will not suffer it to touch

her. In all these circumstances, the lamb, and its mother, which, if not with it, may be easily discovered among the neighbouring sheep, by being thin about the flank, dirty about the tail, and feeble in its walk and bleat, should be immediately put into an inclosure, where her behaviour and disposition towards her lamb will be more directly under inspection. On examination, it will be found that the tips of her nipples are sore, or that she has no milk. In the former case, some mild and emollient ointment, such as simple cerate, may be applied to them; and in the latter, the ewe must be supplied with plenty of green pasture, when, in general, she will soon have abundance of milk, and nurse her lamb kindly. During this time the lamb must be frequently fed with ewe's milk, but after it has been permitted to suck, both ewe and lamb should immediately be liberated. On a sheep farm of considerable extent, it is an incalculable advantage, especially during the lambing season, to possess an inclosure of an acre or two of sound and early pasture, with the folds and smearing-house in some corner of it. In a bad season it will repay half the expense of inclosing.

The carcase of a lamb which dies of hunger is entirely wasted; instead of fat it has a toughish white substance, of a totally different nature, and instead of the curdled milk which is always found in the stomach of a healthy sucking lamb, there is only a little watery phlegm with some air.

Ewes which lose their lambs may be advantageously employed to divide the fatigue of nursing with those which have twins, and to rear the lambs

of hogs, small gimmers, or very lean sheep which have not a sufficient supply of milk. By covering the lamb to be adopted with the skin of the dead lamb, and confining it to the ewe, as directed in the case of deserted lambs, it will be at last permitted to suck, after which it runs no hazard of being repulsed or deserted.

Milk.—A lamb is said to be sick of the *milk* when it appears quite spiritless and dull, with its ears, instead of being upright, lying asunder on its head, is very lank in the sides and belly, and its breathing is short and unequal. These symptoms are succeeded by a purging of a yellowish milky coloured matter, which has sometimes come on before the disease be observed. At other times they die without having had any, or only a little discharge of excrement. The carcase appears well fed; the excrement in the intestines, which are somewhat swelled, resembles in colour that passed at the anus, while the stomach is particularly full of coagulated milk.

This disease never appears in a hard season, but only when the weather is warm, genial, and growing, and there is great plenty of new grass. It does not affect them after they are three weeks old, and is ascribed to their sucking more milk than they can digest; nay, it is even said, that they not unfrequently suck until their stomachs burst. As they are young, and consequently of little value, no remedies or preventives are ever tried.

Pinding is another disease exclusively confined to sucking lambs. Before they begin to eat grass,

the excrement is of a tough adhesive nature, part of which sticks to the tail and buttocks, and when hardened by the sun, sometimes glues them together so closely, that there is no possibility of any evacuation, and the intestines soon mortify and burst.—The disease is easily discovered, by the lamb appearing swelled and sick, with the upper and middle part of its tail closely glued down, and is easily cured, by separating the tail from the buttocks, when the retained excrement is discharged with an offensive smell. Its immediate recurrence is prevented by rubbing the parts over with friable clay or mud; but they should be looked after for eight or ten days, until they begin to eat grass, when all danger from this obstruction is over. It is most dangerous when the ewes are in high condition, and the season dry and backward; and seldom or never appears when the mothers are lean and the weather wet.

Inflammation of the Bladder.—During the first ten days of their life, a few of the males will also die of inflammation of the bladder. But this only happens in cold and barren weather, when they lie too long in one place. To this, therefore, the shepherd must also be attentive; and by proper attention to the weak and exhausted lambs they will frequently recover, especially if they fall a trembling.

Grass ill.—When about three weeks old, and beginning to make grass a part of their food, especially if it be coming in great plenty, a straggling lamb or two will sometimes die of what is called the *grass ill*, which, both from its symptoms, its speedy ter-

mination in death, and the appearances on dissection, seems to be a species of the sickness to be described hereafter, to which the affection last noticed also belongs.

Stiff Joints.—During the month of June, a few lambs in a flock will sometimes be seized with stiffness in the joints, occasioned by the low state of the dam. At that time they are disposed to grow very fast, but for want of proper nourishment they become stunted, and their joints swell, but they generally recover.

Louping ill.—There is sometimes a considerable loss of lambs, by what is called the *louping ill*, which is an affection of a paralytic nature, sometimes lingering, sometimes so speedy, that they are often dead before the disease is suspected. Washing in cold water has been used with considerable success.

Castration.—When they are about eight weeks old, the tup lambs are castrated, which is a painful and frequently a fatal operation. If possible, it should never be done when there is electricity in the atmosphere, when the nights are frosty, or when it rains heavily; but in clear mild weather, or during mild thaw. New built folds, with those resorted to by weasels, are dangerous; and the folds, with the adjacent ground, should be free from mud, mire, dust; nettles, night-shade, and not too heathy. There should always be a large fold, or round, close beside that in which the sheep are to be sorted, into which the ewes and lambs, after being slowly gathered, should be put with as little fatigue as possible; and skilful and experienced persons should be appointed

to catch the males and mark them on the ear, or some other conspicuous part, with tar, and all confusion and hurry avoided; for, as Mr. Laidlaw justly remarks, "in many instances improper management occasions more loss than the whole circle of diseases." When the lambs are taken up to be cut, they should never be catched by the back or flanks, or any other part except the horns or neck; and if a lamb escapes, and has to be caught by dogs, it should be put into another fold, that it may cool leisurely before it be cut.

The operator should by all means abstain from spirituous liquors, and the operation itself ought to be performed as gentle as possible, by slitting up the scrotum with a sharp smooth-edged knife, and starting the testacles, by pressing both hands against the belly of the lamb. In removing them, the cords should be taken between the fingers while the backs of the hands are kept steady against the belly of the lamb, and the stones drawn somewhat upwards, till they separate. Its hind legs are to be directly unloosed, and its tail two or three times hastily pulled, to replace the chord and vessels which have been drawn out. The top of the scrotum should never be cut away, nor too firm a hold taken of the testacles. In performing this operation, the rim of the belly *(peritoneum)* sometimes gives way, and the *omentum* or intestines follow; the latter should be immediately gently replaced; but the *omentum*, if it hang far down, may be cut away and the wound is to be sewed up. After the operation, as much care as possible should be taken that the lambs do not

get sand or dirt into the wound, or irritate it any way. The fatter and stronger lambs are when cut the greater is the danger of loss from inflammation and mortification. When this is apprehended, some farmers anoint the cavity of the scrotum with a feather dipt in turpentine, which is a certain preventive of these effects, but it as certainly checks the growth of the lamb for eight or ten days, and when the folds are clean, the weather good, and the lambs gently used, it is better omitted. If there is to be great loss from the operation, it will be evident the second day. Some will even die the very day of the operation; but the greatest mortality is on the third and fourth, and if the deaths are very numerous they will continue to occur for six or seven days. The carcases of lambs which die in consequence of being cut are generally much spoiled. The belly, flanks and inside of the thighs are absolutely putrid. After mortification begins nothing will check its progress.

The Rev. Mr. Singers mentions a curious fact which deserves to be recorded. "Mr. W. Gibson, on his farms in Crawfordmuir, in Lanarkshire, sustained great loss one season in his wedder lambs, after being cut. To his astonishment, some of the ewe lambs sickened and died, with highly putrid symptoms. The disorder had risen into the form of a putrid fever, which became at last infectious."

But there are also various accidents to which lambs are exposed, such as drowning, falling into pits, and being destroyed by beasts and birds of prey. An experienced shepherd can easily determine if a lamb be lost in any of these ways. If it

has fallen into a pit, the dam runs away in a frantic disordered state, utters a wild sort of cry, comes hastily back, and if she be allowed, will look into the hole or pit where it is: when destroyed by any beast or bird of prey, her behaviour is still more disordered, she runs about from one of her neighbour's lambs to another, and the tremor of her voice occasions a perturbation of her mind; sometimes she utters her woes in a long melancholy tone, at other times her bleat has a wild and inarticulate scream, expressive of her anguish. It requires the most skilful management to get a ewe, which has lost its lamb in this way, to adopt another, probably from having suffered in her attempts to defend it, which, notwithstanding the meekness of her spirit at other times, she does as long as she is able, especially when her lamb is young.

Weaning.—About the middle, or, if the preceding winter shall have been severe, about the end of July, the lambs must be weaned; for any little advantage which may be supposed to accrue to them from allowing them to suck their mothers longer, is much more than counterbalanced by the injury done to the ewes, as it renders them lean, subject to rot the following spring, and barren next season.

Weaning them is a matter of great difficulty and considerable delicacy, especially if their number be large and their pasture inconvenient, and requires all the skill and ingenuity of the most experienced shepherd. Every necessary precaution should be observed to prevent them from wasting themselves with running. In the business of folding, care

must be taken that no material situation be intrusted to an unskilful person. After the lambs are lifted from their mothers, they should be allowed to pass that night in the neighbourhood of the fold.—Most of this time is employed in gathering round, and looking into the fold, bleating incessantly.—Next morning some of them begin to eat, others more impatient gather into crowds, arrange themselves for running, and try to escape away to that ground on which they had pastured with their mothers. They should now be removed to some easy, soft, grassy pasture; and in removing them by all means refrain from dogging them, which is sure of scattering and heating them; neither stop the point of the wedge into which they have arranged themselves, but if the situation of the ground permit, let them go in an uphill direction; and if they get time, and dogs and unskilful people are kept back, there is not much danger. There is, however, some hazard, that they will not rest quietly the first night after they are removed from the fold. This, however, may be effectually prevented by pasturing them with their mothers, the night immediately preceding their weaning, on their future pasture, and driving them to the fold directly in that road by which the lambs are to be removed from it.

The ewes if they are not drawn will in ten or twelve days cease to have any milk; and if the lambs are now left at liberty, they will return to their former pasture, and associate ever afterwards with their mother.

To make it more plain, Mr. J. Hog desires the

farmer to take the ewes of each distinct hill or ridge, and about the middle of July select from each of these a sufficient number of the best lambs to replace the aged, infirm, and barren of that certain department. Let him put a general mark on the mothers, to know them from his other ewes. Let him keep the lambs by themselves, or with the barren sheep until the milk is gone from the mothers, then turn them at large; when each ewe will know her own lamb. Though generally dispersed among the other sheep, the mothers who should have their lambs again to follow them will be easily known, and the farmer should not fail to renew their acquaintance. Of the incalculable advantages resulting from this method of rearing lambs, the country is indebted to Mr. William Bryden, senior, of Riskenhope, many years tenant of his grace the duke of Buccleugh. It both keeps the hogs at home, and makes them acquainted with their own pasture, without hurting the mother by sucking her, and in a few years every little department of the farm becomes stocked with a distinct class of friends, who will never separate; for however thorough they may intermix with other sheep during the day, in the evening they separate voluntarily, and draw to their respective resting places. It may not be improper here as it affords a strong argument in favor of this system, to mention, that no animal is more attached to that spot of earth on which it spent the days of its youth than the sheep. "It is this principle," says Mr. W. Hog, which actuates our draught ewes, in the very centre of England, and upon the richest pasture. One

ewe made her escape from Yorkshire, and after coming through towns, crossing rivers, &c. at last revisited her native clime in the hills of Annandale. Another from Perthshire came back to Hundleshope, a store farm about twenty-three miles south of Edinburgh. When she came to Stirling, it was fair day, she durst not venture through the town among the populace, but rested herself on its north side, till the fair dispersed, and came through late in the evening. There is scarcely a season but parties or individuals are seen passing through our boundaries that we know not whence they come nor whither they are going; and sometimes we recognise Highland ewes that have made their escape from English pastures and are making the best of their way to the north.

"But the above method may not always be found to be convenient. Upon certain farms a great number of hogs are kept in proportion to the old sheep. Certain parts of these farms may be high, as is often the case, to which sheep can have no access for a great part of the year. Upon such parts it is necessary to summer grass the ewes. And that every possible benefit and advantage may be derived from such high places, it may be found necessary to stock them sufficiently with the old ewes; so that, if in such situations the lambs were confined with their mothers, both might be equally hurt.

"In such a case, the treatment of the lambs intended for hogs should be as follows. After weaning the lambs I would recommend putting them for two weeks upon clean low land, and thereafter

sending them out to a summer hill by themselves. And in practising this mode, if the summer hill is covered with much of what is called *bent-grass*, the lambs should be sent out to it immediately on being weaned, or as soon as they will drive. The reason is, that this kind of grass is of very little use for pasture after the middle of August. But if the part of the farm intended for the lambs after being weaned is clothed with a mixture of heath and grass, or wholly either, there need not be so much dispatch in sending them to it.

"I am quite of a different opinion from many as to the mode of summering lambs. If, as circumstances permit, either the above methods be observed in a proper and judicious way, instead of injuring the hogs, I think they may be bettered in many respects. For instance, if a farm is so situated that sheep cannot pasture upon two thirds of it, perhaps from Martinmas till near the first of May, what is to be done for winter food? The generality of low country people have scarcely an idea of such a situation. The example of the bee must here be surely followed, laying up something in summer for winter store. By driving the old ewes to the high extremities of the farm, and summering the lambs upon good healthy pasture nearer home, the lower lands are reserved for winter food. The lambs in this manner learn the different marches; and they often eat up several plots of ground, where from their local situation, the old sheep might not be very easily confined. By summering lambs in this manner, I do not at all mean pinching them. I would have them

always kept in a thriving state; which may be easily done, however high or coarse the land is, by giving them plenty of space to range upon, and by not keeping them too long upon one spot, but frequently shifting them from place to place.

Besides, by being thus accustomed to such coarse food in summer, they live better on it in winter, if it should prove severe, and they have nothing else to depend upon. They also acquire a greater hardiness of constitution than lambs that pasture in August and September on soft grassy lands, and they are said to be less liable to sickness. It certainly makes them eat their winter pasture more equally, which is generally allowed to be a preventive of sickness. They should therefore by no means be suffered to feed the whole day on those parts where the finest grass abounds, but should be kept from four to five in the evening till seven or eight next morning, on the high part of their ground, where there is plenty of coarse meat. From the end of September, or beginning of October, when the ground is completely drenched with rain, they may be allowed greater liberty.

By this method of treatment they are said to rise superior in wool, bone and condition, to other lambs, and to acquire that uniformity in shape, size and colour, which is necessary for the English market. It, however, subjects them to severe loss from sickness, which is almost entirely avoided, by allowing them to follow their mothers; and where no more lambs are kept than what are necessary to replace deficiencies in the stock, this method should be al-

ways adopted. By associating with the old sheep, instead of lying all night without rising, and indulging next morning in rich food to excess, they benefit by the experience of their mothers, by which means they commonly leave their resting places about eleven at night, and feed till one or two in the morning. By not undergoing the fatigue inseparable from herding, they are also more active, are better enabled to support the severities of the winter, are in better condition next spring, and in every respect thrive better the ensuing season.

*Sickness.**—This is the most quickly fatal of all the diseases to which sheep are liable, for not unfrequently out of a flock of 300 hogs, all of which the night before seemed in perfect health, six, seven, or more, are found dead; some of them with their feet under them as they had laid down to rest. When its progress can be observed, the animal seems to become uneasy, ceases to feed, but, when it has an opportunity, drinks frequently. When narrowly inspected, its eyes are found to be half closed, dull, inflamed, and watery; the mouth, tongue and skin dry and parched; the pulse strong and frequent, and the breathing quick and difficult. It grinds its teeth, lies down and rises up repeatedly, or stands motionless, with its head hanging down, and its back erect, or creeps away from its comrades, with a slow and stiff motion, to the edge of some precipice, or overhanging rock, holm, or other re-

* *Sickness*—Mr. Stevenson, Mr. W. Hog, Mr. Battie, Mr. Laidlaw. *Sickness* or *Braxy*—Rev. Mr. Singers, Mr. J. Hog, Mr. Scott. *Braxy*—Mr. Welsh, Mr. Campbell.

tired spot, while it lies bleating, or rather screaming from agony, its wool claps to the body, which swells sometimes to such a degree that the peritoneum, or rim of the belly, as it is called by the shepherds, gives way, and strong convulsions are succeeded by death in a few hours from the first attack. Some of them will live several days, but seldom a week, unless they recover, which is a rare occurrence. During this time there is seldom any passage through the bowels, the urine is scanty and high coloured, and the blood is absolutely black, and so thick, that when a vein is opened, scarcely a drop or too oozes from the orifice.

Appearances on Dissection.—On examining the body after death, almost every part of it exhibits appearances more or less strongly marked of inflammation and mortification, or a tendency to putrefaction. When the stomach, intestines, or other abdominal viscera are most affected, it is said to be in the read or bowels, and when the muscular parts, to be in the flesh or blood. Again, when in the first of these species, there is a remarkable effusion of bloody serum in the cavity of the belly, it has been called the *water-sickness.* From the dissections which have been made, there appear to be even more kinds of sickness than those named; and although the practical utility of such distinctions in a disease so speedily fatal, may not be immediately apparent, it is necessary to enumerate them, that at last, by observing particularly the other morbid changes with which they are sometimes or always accompanied, the symptoms which affected the an-

imal when alive, and the circumstances which preceded the attack, we may obtain a perfect history of all the forms of this destructive disease.

A. *Varieties of Bowel Sickness.*—Sp. 1. Most commonly the stomach is its chief seat, constituting what nosologists term *gastritis.* In this variety the belly is prodigiously swelled, the carcase is much discoloured, and a sour pituitous matter is diffused through the whole system, especially the fleshy parts. The fat appears least changed; but although it melts to grease it has always a bloody appearance, from which it cannot be cleared. On opening the body it emits a strong sulphureous smell, characteristic of the disease; hence it is sometimes called the *stinking ill,* and the stomach and bowels are prodigiously distended with air, having the same intolerable fœtor. A general redness pervades the whole bowels. The two first stomachs are rarely the particular seat of the disease, the third occasionally, but the fourth, and especially that part of it next the intestines, known amongst professional men by the name *pylorus,* is always much thickened, inflamed, or even mortified. The food found in the stomach, especially the third, is quite dry, and may be crumbled to powder between the fingers. The kidneys are completely mortified, and resemble a mass of putrid gore. The liver is also much affected. The heart and lungs only partake in some degree of the general redness.

This is the most common kind of sickness, is peculiar to hogs on the first setting in of frost, is not to be distinguished during the life of the animal,

but by the excessive swelling of the belly, and is almost always speedily fatal.

Sp. 2. The variety most nearly resembling that now described, is that, where instead of the stomach, the small guts are inflamed and mortified, constituting the disease called *enteritis*. In this the carcase is much less swelled, and not nearly so blue and putrid, except that the chewed grass in the maw is very stiff, and almost quite solid to feel; the stomach is scarcely affected in the least, but the small guts are mortified, black, soft, and almost quite rotten, the inflammation having obviously originated in one of the latter folds of these. "In one or two instances I observed a small fold or doubling in the intestines, which, by some wind passing through them, had forced its way through the thin texture that covers them, and by which the fat hangs. This was full of air, quite black and mortified, as were several of the folds above it." Indeed Mr. J. Hog plausibly enough conjectures, that this variety is caused by a twist or intus-susception of the intestines, produced by enlarged and hardened lumps of purl obstructing all passage through them.

It attacks only hogs which have plenty of grass when the weather is mild, during storms of snow, when their walk is much circumscribed, and when they are confined to the tops of heather, bent, and other dry sapless food. It is not so speedily fatal as the former species, and they sometimes linger a day or two in great agony, without appearing much swelled.

Sp. 3. The seat of the disease is sometimes in the urinary bladder, constituting the *cystitis* of nosologists. The symptoms resemble those of the first species, and the putrid taint of the carcase is nearly the same.

Sp. 4. Sometimes on opening the belly the whole bowels are found swimming in bloody water, although none of it is contained in the intestines.—The gall-bladder is contracted and shrunk to a size scarcely observable, and is almost empty of bile.—The membranes connecting it with the other parts are inflamed. The urinary bladder is always empty, but Mr. J. Hog did not find it to be ruptured in the cases which he examined, as from the Rev. Dr. Findlater's observations he had been led to expect. The smaller apartment of the stomach had some purple spots on it which were thicker than the rest of its substance. In this variety, the peritoneum covering the whole intestines, and lining the cavity of the belly, is the seat of the disease, which then would be *peritonitis*.

It may be known during the life of the animal by the swelling hanging low instead of rising up at each side of the back, as in the first species, and by an evident feeling of fluctuation when the one hand is applied flat to the one side of the belly, while the opposite side is struck by the palm of the other hand.

B. *Sickness in the Flesh and Blood.*—Sp. 5. "In some instances of the disease, and these the most violent, no *one* part of the stomach or bowels seems to be more affected than another. There is a general redness over the whole, and the flesh of the an-

imal is quite tender and soft, soon assuming a greenish hue. In this case *(phrenitis?)* the brain partakes of the affection, and its vessels are red and turgid, exhibiting, with the exception of the blackness, the same appearance as that mentioned in the bowels. In all cases where this is observed after death, the disease has been very quickly fatal, seldom exceeding four, or at most six hours from the first apparent affection." Mr. Stevenson.

Sp. 6. "That species of sickness which is seated in the blood is not so readily discerned in the living animal; nor does it affect the carcase so much if blood be let. There seems to be a tendency in the blood itself to decompose and putrify, and not unfrequently there are appearances of inflammation on the membrane lining that lines the breast *(pluritis;)* or on the diaphragm *(diaphragmitis,)* and the distemper has a strong resemblance to pleurisy." Rev. Mr. Singers.

These two species, if indeed they be distinct species, are both included by the other writers under the same denomination, and it is therefore scarcely possible to ascertain to which of them their observations belong. Mr. J. Hog says, that the whole body is *hoved* and swelled like a loaf, that the fore legs are certainly the worst, that the kidneys are in the same state of mortification as in the two first species, that the symptoms and the smell are the same, that they are carried off by it in the same short space of time, and that it is the same disease with the *black spauld*, which prevails among the young cattle in the west of Scotland when the grasses fail,

and they begin to feed on fodder and dry herbage. He also observes, that all the old sheep which die of the sickness, as well as the hogs which fall in May, are carried off by this species, although individuals die of it at the same season, when they are dying in great numbers of the bowel sickness. On the whole, however, the mortality is not nearly as great, nor indeed above one-tenth or one-twentieth of that occasioned by the other.

Causes of Sickness.—Although a few old sheep and lambs occasionally perish from the sickness, it may be considered as a disease peculiar to hogs, and the sounder that hogs are bred, and the higher condition they are in, the more apt is the sickness to break out among them, the more violent are its ravages, and the sooner do they die when attacked. Heath sheep are also supposed to suffer more from it than the white-faced and fine-woolled breed.—When it sets in severely, it is not uncommon for one-tenth of the young sheep to be carried off by it. But as it is not half so fatal to hogs which are allowed to pasture with their mothers, as to those which are hirseled or reared by themselves, it is proper to notice in this place the manner in which these plans affect the habit of the animal. By hirseling, they turn out more uniform in shape, size, and condition, but they acquire a dullness and inactivity which does not leave them till next season, and then not entirely. They are also deprived of the experience of their mothers, and feed injudiciously, gathering in crowds, and indulging in the richest spots of their pasture, remaining all night on their layers

without rising to eat, or to pass dung or urine, and next morning devouring to excess any thing that comes in their way; they are less capable of sheltering themselves in storms, or finding food when the ground is covered with snow; and are less able to support the hardships of winter, losing their high condition very quickly. Their constitution also is enfeebled, and does not last more than six or seven years.

On the contrary, by adopting the more natural plan of allowing them to follow their mothers, they benefit by their experience, both in sheltering themselves in severe weather and in their manner of feeding, rising along with them to feed an hour or two every night, and in the morning, after cropping a moderate quantity of rich grass, setting out of their own accord to the upper parts of their pasture. They thus become more active and vigorous, suffer less from the severity of winter, and acquire a constitution which lasts for eight or nine years.

Notwithstanding some sheep die of sickness in all seasons of the year, its ravages are almost entirely confined to the winter months, and commence sooner or later, according to the state of the weather. It is not frequent till Martinmas; and if considerable numbers die before the time of smearing, it indicates great loss from it through the winter.—It seldom prevails until after the vegitation has been checked by frost in the month of October, and it is most destructive in November. When at that season there is any sudden change from mild weather to frost, or if rainy days are succeeded by frosty

nights, especially when accompanied by hoar-frosts, it is particularly fatal; so much so, indeed, that in going out in the morning the shepherds will put on old clothes, as they expect to have some of their hogs to carry home. It becomes less frequent after steady frosts set in; but again carries off a few in May; and Mr. W. Hog says, that he has invariably observed, that deaths are more frequent a day or two before the weather actually changes.

"The sickness may be immediately brought on by means of frozen grass. It is dangerous for the young sheep to haunt through night among those spots of ground where frost-mists settle deep on the softer grasses. But in dry pastures they are more eager to get at these spots than in green walks, being urged to seek after the most succulent grass to abate thirst, and the hollow spots of a dry sheep-walk, on a southern declivity, are very likely, when in any degree moist, to be heavily loaded with hoar-frost. The effect of grass eaten in that state on the tender bowels of the hog sheep, resemble those of frozen potatoes eaten by black cattle, which immediately engender astonishing quantities of noxious gases, and quickly bring on inflammation and mortification." Mr. Singers.

Another immediate, and often very destructive cause of sickness, is, when they are obliged by a heavy storm of snow to work and eat on places already bared and fouled; for in these circumstances they eat any thing which comes in their way, as rotten fern, spratt, fog, roots, or whatever they can reach.

Pet sheep, and others that have night shelter, are said by some to be seldom affected by it; but Mr. J. Hog asserts that he has seen many instances of domestic sheep, called pets, dying of the sickness; and that in the counties of Ross and Southerland, where many of the small tenants house their sheep every night of the year for fear of foxes, the sickness rages with uncommon severity.

With regard to soils, the hardest, driest, and soundest, such as ley heather, are most subject to sickness. Such pasture has the same effect upon them as corn has upon horses. Their bellies are lighter, they run faster, they keep their wind longer, they are of a hot, dry, and costive habit, and are subject to inflammatory diseases. Ley heather in general grows in bushes, and is remarkably strong and heating, while around its roots the grasses are of the softest and most delicious kinds. Indeed, all kinds of pasture, of which one part is fine and another coarse, are liable to great loss from sickness. Sheep are remarkably fond of sweet juicy herbage; any spots of it therefore soon become eaten, trodden down, and foul; but this does not hinder them from occupying these favourite spots, and filling their stomachs with raw watery food, plentifully intermixed with impurities. Hence the danger of the grass growing round mole-hills, on the banks of rivulets, &c. and of grass the produce of sheep tath, such as that of old sheep-walks, and especially of what is called the hog-fence. Tath-grass they nauseate until it has been affected by the frost, when they eat it in quantities evidently dangerous to them.

Cure of Sickness.—This disease may almost be said to be incurable, for even if we were possessed of a specific against it, as Mr. W. Hog justly observes, it would avail us but very little, as one half of the sheep attacked by it are dead before they are discovered; and when they do recover, it leaves them in such a state of weakness, that they have little chance of surviving the severities of winter and spring. Notwithstanding this, numberless remedies have been at different times extolled as certainly successful; but, as might naturally have been expected, they have fallen into neglect. Some of them, indeed, such as the exhibition of whisky, could only aggravate the disease. If in any instance a cure is at all possible, it can only be effected by such means as are calculated to counteract inflammation. Of these, blood-letting is chiefly to be relied upon, and the veins at the tail, inside of the fore leg, and angle of the eye, may be opened. At the same time, refrigerants, such as nitre; or cathartics, as glauber salts or common salts, castor oil, infusion of tobacco, may be exhibited, either by the mouth, or tobacco-smoke in the way of glyster. If the blood should flow freely, and purging be induced, recovery may be expected.

Mr. James Hog recommends another mode of treatment, from experience. "The only cures which I can freely recommend are in every shepherd's power. 1st. If the animal be found in time, let him give it a severe heat, by running; and if this do not cure it, nothing I am acquainted with will.—However unfavourable this may appear, let him hunt

it well, and follow after it, that it lie not immediately down on leaving it, or if it will lie down, let it be in a house. Many shepherds have discovered this by chance, who are yet ashamed to be the first to own it."

"The next is bathing among warm water for the space of ten, or eight minutes at least; when a quantity of water gruel, mixed with butter or some softening ingredient, may be given them as an injection or otherwise. Care must, however, be taken that none of these is administered for the water-braxy, because either of them occasions instant death."

Prevention of Sickness. Since so little can be done in curing this disease, our principal efforts must be directed to prevent it. This is most effectually done as has been already stated, by pasturing the hogs among the old sheep: where however this cannot be practised, and the hogs are hirseled, it is of material consequence to provide against the season of sickness a supply of green succulent food. Indeed, this disease "sets in early or late, in proportion as vegetation ceases early, or continues until a later period of the season. This is now perfectly well ascertained, and generally acknowledged; and likewise that all kinds of food which preserve a continual vegetation are effectual preventives; such are clover, turnips, sea-marsh, and the dark coloured tath which grows in abundance on drained ground that has formerly been marsh. This last being so green and soft, and continuing to vegetate at all seasons when the weather was mild, induced many people to believe that it was of a flatulent nature, and would

increase the malevolence of the sickness, but experience soon evinced to the contrary, and that in proportion as this grass was nourished by the prevalence of the draining scheme the sickness by degrees disappeared." Mr. J. Hog.

A moderate use of turnips is also almost a certain preventive. "Small turnips," says Mr. Singers, "on coarse moor-land answer very well; or if the larger turnips are drawn, the smaller ones may be left for the sheep; or a few may be taken out of any field at pleasure, and thrown down on any barren spot which it is wanted to improve, the sheep being conducted thither for an hour each day. The effects of these easy and simple modes of preventing sickness are really encouraging. Mr. George Brown, of Caldholm, on the lands of the duke of Queensbury, has tried it for several years with a success greater than he himself expected. Mr. William Johnson, at Mollin, on the estate of the earl of Hopetoun, has also found it beneficial beyond his hope. These two farms were severally tried with this distemper; and it consists with experience, that their losses have been considerably reduced. But these instances are only two out of many."

The protection of stone walls, especially when that of forest trees behind them is superadded, is also of material consequence.

Care should also be taken at no time to overheat them, nothing is more apt to injure sheep in high condition.

The margins of rivulets, and other places abounding with rank grass, should either be inclosed, or cut

down for other uses. The mole-hills also should be carefully spread. But, although every precaution must be taken to prevent the hogs from eating such succulent food to excess, starving is almost equally destructive; and in hard weather they should either be removed to the lower parts of the country, or hay and turnips may be given them upon the spot.

The number of hogs in one hirsel should seldom exceed five hundred, as at certain seasons it is almost impossible to do a greater number justice, and prevent them from doing hurt to each other.

Much may also be done by proper attention in the selection and management of the hog-fence.—The part of the farm appropriated to this purpose should consist, as nearly as possible, of one kind of soil; and it is no great matter what the nature of the soil be, provided it be nearly uniform; it is but stocking it the lighter, and sheep will thrive as well upon coarse land as upon fine, if there are few or no sweet spots interspersed through it.

Mr. Welsh, while he approves of the general practice of saving the winter pasture intended for hogs, from the beginning or middle of August till the beginning of October, if they can be so long kept in a thriving condition, strongly reprobates, as a deliberate preparation for the braxy, the custom of previously eating it quite bare, by milking ewes, feeding cast lambs upon their mother's milk, &c.

If ley heather be unavoidably situated within the bounds of the hog's winter pasture, care should be taken, on the first opportunity that offers, to burn down every bush of it, by which means it will be

converted from an incentive to a preventive of sickness; for the young sprouts which grow upon burnt ground are generally laxative, and easy for the stomach.

"Experienced shepherds," says Mr. Singers, "have also found benefit from visiting their young sheep every morning at an early hour, when the approach of sickness is dreaded. If any danger arise from the degree of external cold, the sooner they get up and move about the better; and should the bladder be affected, the sheep may have some chance of relief, from rising up and passing their water, whereas by continuing on their layer this danger increases every hour."

Bleeding about Hallowday is said by Mr. Campbell to be almost a certain preventive. He directs the hogs to be collected, about fifty at a time, and to be lifted, the fattest first, and laid upon a table, two boys holding them by the feet. On the other side of the table, having the animal's back towards them, and its head to their left hand, stands the bleeder and his assistant. The latter with a pair of sheep scissors, clips away the wool above the jugular vein, about the breadth of a crown piece, and puts a soft woollen bandage round its neck, near the shoulder, until the vein rise. Then the bleeder, to prevent the vein from shifting, applies the fore finger of the left hand on one side of the vein, and his mid finger on the other, and holding the lancet between the finger and thumb of his right hand, with about half an inch of it uncovered, strikes it with a smart jerk into the vein, directing its point oblique-

ly upwards. If the blood appears bright and thin, a wine glass is sufficient, but if dark and thick, double the quantity may be taken. The bandage is then to be removed, the lips of the wound brought together, and the hog's tail drawn backwards as it is set away.

"About Martinmas," Mr. Laidlaw very judiciously observes, "I have heard of the whole hirsel being folded, and doses of, I know not what, poured down their throats, no doubt some strong purgative, to free the creature of some of its *exuberant fatness!* which hath cost the anxious shepherd so much pains, and the intelligent farmer so much expense. I have heard also of chasing them at night, when setting them out to their layer, till they began to blow pretty hard; but for my part, I would rather choose to see them walk calmly, for this reason: any sudden and violent exertion of the animal powers rather obstructs than assists digestion. And sure I am, that many *feats* of this kind will waste both the flesh and constitution of the animal. In short, whatever preventives (I mean those of the drug kind) are made use of, they have all one tendency; that is, to make the creatures leaner. But it is surely very inconsistent to use every prudent method to fatten them at one time, and at another to disregard every thing but saving the life of individuals. And altho' some attempts of this kind may at times become proper, yet, generally speaking, such as use remedies of this kind may at least take a more profitable method. Keeping more sheep on the same bounds will effectually answer this purpose—save the ex-

pense of drugs—and give the profit of the extra sheep into the bargain!"

When the sickness breaks out with violence, the best mode of checking it is to give them turnips on their own pasture, or to remove them to some other situation, where they can get plenty of succulent food; but this expedient is attended with danger, and should not be resorted to unless there is a probability of very great loss; for although it generally puts a stop to their dying, it often begins again when they return back to their own pasture; and being removed at an improper time of the year, if the spring be hard and severe, poverty always sets in amongst them.

Cases of Sickness, drawn up by Mr. Stevenson.

Case I.—In the month of November, the 18th, if I recollect right, 1802, a young sheep was brought home by the shepherd, affected by sickness. The wool was clapped, the eye was languid, red and watery. There was great heat over the body. The mouth was dry, the breathing quick, and somewhat difficult; the pulse beat frequent and strong, and its limbs seemed scarcely able to support it.

The tail was cut across in two places, when a considerable quantity of black thick blood flowed from it. As no glauber's salts could be had, a handful of salt was given it, dissolved in warm water, from a tea-pot; it was put into the house, and the door shut. In about half an hour it was laid down upon some straw, and appeared very weak. On approaching it, it rose, but could scarcely walk. The tail was still dropping blood. In two hours after it was stand-

ing, and run away to the other side of the house when it was approached. The eye was rather more lively, the tail had ceased bleeding, and it walked without any difficulty. In two hours more it was eating some hay that had been given to it, and the salt had purged it very freely. It was kept in the house all night, and next morning, when let out to the park at the back of the house, it eat a little. The wool was still clapped, but the eye was lively, and the burning heat was gone off the skin. The purging continued all day; it was again put into the house at night. Next morning when let out it seemed quite well, eat very well during the day, and next day was sent to the flock. It had no relapse.

Case II.—On the 7th December, 1804, another sheep was brought home. The shepherd had seen it affected in the morning, but it was not brought home till after dinner on account of the distance.—When brought home it could not stand, which we attributed to the tying of its feet, for the purpose of being carried home, a distance of nearly four miles.

The eye was dull, wool clapped, pulse quick and strong, mouth dry, breathing very quick, and a kind of palpitation at the heart. When the shepherd laid it down from his back, it made some water, which was red like blood.

On cutting the tail, two or three drops only of blood, black and thick like tar, followed the incision, which, however, soon stopped. The vein on the inside of the fore leg was opened, from which also no more than two or three drops came, of the same black and grumous appearance. The ear was also

cut in the inside, but little or no blood came from it. An ounce and a half of glauber's salts was given, in half a mutchkin of warm water, and an old blanket thrown over it. In three quarters of an hour the tail was bleeding very freely, but the other places had stopped. The animal was lain down, and could not rise. The pulse was quick, and it was apparently very *sick*. In the evening, about two hours after, it was much in the same way, only the skin was not quite so hot. It got a little meal boiled in water, and the blanket was left on it during the night. On looking at it next morning, it was risen, but scarcely able to walk. The tail had bled a considerable quantity, and it would not eat. The wool was clapped to its body, and it sill had a very languid appearance (probably from the blood it had lost.) It got a little more boiled meal and water, and the salts had operated. In the afternoon it was eating a little boiled hay; and from this time it gradually recovered, without any other application. It continued very weak for about eight days, when the wool was risen to its usual appearance, and it was sent to join the flock.

As the sickness did not appear in the flock, I had no opportunity of again trying the practice at that time.

Case III.—In the beginning of March, however, 1804, at which time the weather was very cold, a young sheep or hog was brought home in the afternoon, gasping for breath, pulse very quick, eye quite blood-shot, skin remarkably hot; had been observed not eating in the morning, and seemed even then

remarkably languid, but made no motion as if affected with pain.

On cutting the tail across, a few drops of blood, like tar, followed, but stopped immediately; the ear was cut, the neck-vein was opened, the vein on the fore part of the belly, as was also that on the fore leg, from none of which above a drop or two came. A dose of salts was given, and it was covered with a blanket. On going to look at it about an hour afterwards, it was dead.

On opening the body, the fourth stomach was found mortified over all its upper and fore part, which extended to the place where it joins the bowels, which were all quite red, as were the stomachs in a less degree. The internal coat of them all was very loosely attached, and the smell was extremely disagreeable; there was a reddish or livid appearance over the whole body, which arose partly from the blood not having been drawn from the animal, but more particularly from the previous inflammation that had existed. The right auricle and ventricle of the heart were quite full of the same dark kind of blood as came from the incisions made before death, and the whole flesh was quite soft.

Case IV.—On the 14th Nov. 1803, a young sheep was observed affected with sickness, belonging to a friend, during the time I was on a visit at his house. He had ordered it to be killed, alledging that sickness was uniformly fatal; but was easily persuaded to try something for its relief, as, if it succeeded, it might be advantageous in cases of a similar kind.

The appearance of the sheep upon viewing it was

by no means favourable upon a trial. The wool was clapped, the eye was red, the pulse strong and full, the skin very hot, breathing laborious, with considerable wheezing, and it was scarcely able to stand. The belly was somewhat swelled, and the mouth quite parched.

It was bled, as has been described, in the tail, neck, fore leg, hind leg, belly and ear, from which there was a little blood got, of a dark colour. As no glauber's salts could be had, a handful of salt was given to it, dissolved in a tea-pot full of warm water, and it was left in a house by itself. In half an hour it was laid down, and we thought it dying.—On going to it, it rose, but could not walk. The tail was bleeding pretty freely, and the blood flowing from it was rather of a redder colour, the pulse was quicker, but not so strong, and the other wounds had bled a little; the symptoms were not increased, but did not seem better.

As there happened to be some saltpetre (or nitre) in the house, we gave it a tea-spoonful of it in another tea-pot of warm water, but reserved the half which was afterwards given, at the interval of an hour, when the heat was rather less, and the skin somewhat moist. At the end of the second hour, it had made a considerable quantity of water, and seemed rather more relieved. In two hours more the salt had operated, and the wounds still continued dropping. It got a large tea-pot full of meal and water. Next morning it looked much better, but would not eat. In the afternoon, however, it eat a little boiled hay, which it lived on for two days,

when it was put into a park by itself. In two days more it was sent to join the flock.

Case V.—In the month of April, 1804, when the weather was unseasonably cold, on the 12th, a hog was brought in, affected with sickness. It was observed by the shepherd at mid-day, and was brought home in the afternoon. It was bled in the tail, from which a considerable quantity of blood came; it got a dose of glauber's salts, and had two tea-spoonfuls of nitre dissolved in a chopping of boiling water, of which it got half a mutchkin every two hours. At bed-time the tail continued bleeding, and it seemed rather easier. On looking at it next morning, it was stiff, having died in the night.

On opening the body, the general redness apparent in sheep dying of the sickness was very observable; the bowels were all affected, but none of them seemed to be the immediate seat of the disease, as no mortification was apparent on any of them. The flesh of the body was all of a livid hue, and the inflammation seemed to be generally diffused over it. Black clots were found in the right auricle and ventricle of the heart, and the food in the stomachs might have rubbed between the fingers, like dry sand or chaff. There was also a redness observable in the brain.

I have had many more opportunities of making experiments upon sheep affected with sickness, a detail of which, after what has already been said, would be unnecessary. Taking the average, however, of those that have been affected, I have been enabled, by the practice laid down, to save three out

of five. The proportion is even greater; but allowing for contingencies, such as their being nearly dead before being brought home, I have stated this as the proportion.

Number affected . .	25
——died . . .	9
——recovered . .	16

Trembling, Thwarter, or Leaping Ill.—These three appellations, of which the last is most common in Annandale, and the first in Selkirkshire and to the eastward, are now used as synonymous; but they are applied indiscriminately to all diseases which, on a dry soil, proceed from a debilitated state of body and barren seasons. "Under this triple name," continues Mr. J. Hog, "I have seen sheep suffering by diseases, which at least had much resemblance to rheumatism, ague, palsy, and apoplexy; and even when an old sheep falls down and dies of weakness and debility, the manner of their death differing somewhat from that of hogs, it is frequently ascribed by shepherds to the *trembling* or *thwarter ill.*" In confirmation of this opinion, there is so much diversity in the descriptions of this disease, its causes, and method of cure, as given by Mr. Stevenson and the other gentlemen, that any attempt to reconcile them would only lead to confusion; and therefore, it will be proper to consider them as distinct species.

Species 1st.—This disease is much more rare than formerly, and is scarcely known in the highlands. It appears in spring and harvest. It affects sheep of all ages and kinds, but never when in good

condition, and it exists chiefly on dry farms, having a northern exposure, which are evidently overstocked, and on these only when the spring is severe and dry, or when early April grass has been cut down by frosts, and the sheep can find no succulent food or any thing green. Its production is favoured by a long continuance of easterly winds; and in cold weather ewes are sometimes attacked by it, even after they are fleeced. In these circumstances they become extremely emaciated, especially when many of them are heavy with lamb or giving suck; and "if at this time," says Mr. J. Hog, "they get an over stretch in running or leaping, or even a hasty start, or crush in the fold, numbers fall a prey to this disorder, or rather to these various disorders. Some will fall down and die in two or three minutes; others will lose the power of one side, and lie sprawling till they die of hunger; others again will lie shivering, and very sick at times, until death also comes on; and some will go a long time quite lame, carrying sometimes one limb, sometimes another, till they are likewise quite exhausted." Mr. W. Hog describes it as of two kinds, sometimes seizing the whole system, when there is a general trembling over the whole body, and sometimes affecting the legs only, when the animal immediately falls down, and the shaking, which is uninterrupted, is confined to the legs. Mr. Welsh says, that the animal gradually loses the power of its legs and body, until it becomes quite weak, always lying at last upon one side. Those which die of it in spring are lean and useless; but the mutton of fat hogs carried off

by it in September is not uneatable. It is sometimes extremely fatal. In one instance, out of a flock of forty score, seventeen score were lost in one spring. It was formerly thought to be contagious; and although this can scarcely be the case, it is certainly most destructive when it first comes among a flock; and when sheep are brought from a clean ground to one infected with it, great numbers of them are sure of dying. Those which survive it one season are sure to relapse next spring.

Udder-locking, as has been already stated, should be entirely laid aside. Mr. J. Hog mentions one instance, where one-twentieth of a large parcel of ewes died of this disease in the course of one week after they had been udder-locked. It is also useful during the months of April and May to provide them with sufficient shelter and food; and to avoid overstocking if the early grass has been blighted, to pasture them in a rich park, or water-meadow, or on moss, and early rye-grass.

Various cures are recommended. When they fall down suddenly, and are threatened with immediate death, bleeding, by cutting the tail or opening a vein on the inside of the fore thigh, will sometimes give instantaneous relief. In all the other cases it is proper to take them home, and feed them with strengthening food; and if at this time they are attacked with a temporary diarrhœa, they recover very fast, and soon acquire their former vigour. Mr. Welsh says, that there are a few cures tried, but he believes with little success. Dipping in cold water is often practised. Whiskey and gunpowder are

poured down their throats. Balls of mustard and hot pungent medicines are often administered.—The Rev. Mr. Singers recommends bringing them into the house, giving them a mixture of equal quantities of warmed sallad oil and spirits, with a litle finely powdered ginger, at the same time rubbing into the back a little black soap broken in warm water, and feeding them on hay, the produce of dry walks.

Mr. James Hog also mentions the uniformly successful treatment of sheep affected with this disorder during summer and autumn, by giving them a decoction of the *dew-cup* and *healing-leaf* boiled in butter-milk.

Species 2d.—The second species is so particularly described by Mr. Stevenson, that it will be sufficient to quote his account of it.

"This is a disease which is chiefly confined to the flocks in the south of Scotland, more particularly about the banks of the Tweed, and of those rivers which discharge themselves into it. It is a complaint almost unknown to the farmers on the Pentland range, and to the north of the Forth.

"In those places where it prevails, it is sometimes peculiarly fatal, and a farmer often loses more of the flock by this alone than all the other diseases put together.

"When this disease first comes on, which is generally during the summer or harvest months, the animal turns somewhat stupid and neglects its food, doses round as in the sturdy, and frequently leaps up, as if to clear any bush or dike before it; at times it will eat voraciously, and again refuse all sustenance

for a considerable time. It continues leaping frequently during the day, and the neck is frequently stiff, and turned to one side* : convulsions take place in the limbs, which make the animal fall down, make curious contortions, and at times run to a little distance : the body sometimes partakes of these when the animal turns, totally incapable of motion, and dies from want of food, which the jaws will not open to admit, being closely wedged together. In this state it is unable to follow the flock, and the wool claps to its body. It lies for a long time motionless, and at length dies. After lying motionless for a considerable time, in those cases where the disease is not so violent, and the spasm of the jaw not so severe, it gradually relaxes, and they will eat the whole of the food within their reach, although the power of the limbs is totally gone. They will so completely eat all the grass, that they will leave the earth quite red all around them. If the shepherd is attentive, and lifts them from one place to another, and the season pretty well advanced, they slowly recover, and again are restored to the use of their limbs. When they lie in the inactive state mentioned, if the weather is warm, maggots are very apt to breed in them; and if not attended to, soon destroy them.

"This disease appears commonly during the summer and harvest months, especially during hot and sultry weather, and arises either from the sheep being put into violent motion by dogs or overheated by the sun; in which case, in a few hours after, it

* The sheep are often affected with wry necks, without any of the other symptoms, which may be considered as a lesser degree of the same disease.

makes its appearance by the stiff neck, or some of the other symptoms coming on. When the sheep are exposed to fatigue it will take place, if the weather is warm, independent of violent motion.

"It is generally the *fattest* of the flock that are cut off by it.

"This disease arises often from the braxy, and is generally a favourable sympton. It is never severe, however, when it is a consequence of braxy, and the stiff neck never accompanies it.

"On opening the head of those that die, the vessels of the brain are slightly turgid and red, which, however, is always the less the longer the disease has continued.

"As the disease arises from the brain being oppressed, by too much blood being sent to it by the quickened circulation, the first thing to be attended to on the appearance of the disease is copious blood-letting, which will be more effectual if taken from the veins of the neck, or from a vein in the outside of the eye, generally well known to shepherds. It may even be taken from the tail or fore leg; but the veins of the head being open, is generally considered most effectual in this complaint. As there is too great a determination of blood to the head, it will be attended with advantage to make a determination to the bowels, by stimulating them by purgatives, such as glauber's salts an ounce, calomel ten grains; or what is more proper, as it always acts upon the kidneys and skin, a dose of half an ounce of nitre. These must be persevered in till the symptoms disappear. But if the animal is too far gone in

the disease, and has lost all motion, it should be killed for the sake of the carcase, which in this disease is not affected, or at least but slightly."

Cramp of the Legs.—" This has by some been denominated the *wood evil*, from its generally arising from the drippings of trees in cold and wet weather. It seizes the legs of sheep and makes them totally incapable of walking, and will at times spread thro' the flock at once. In this disease, the action of the nerves of the legs seem to be so much impaired by cold as to destroy their energy.

" Mustard has been recommended to be given internally, a tea-spoonful night and morning. But the most effectual method of removing it, is to rub the parts affected with warm flannel, and keep the sheep dry. A little oil of turpentine may be used externally with advantage, if the rubbing does not otherwise succeed." Mr. Stevenson.

Sturdy.—The *sturdy* is a disease of considerable importance, both on account of its frequency, and because it always proves fatal, unless when relieved by art. Two varieties have been described.

Variety 1st. When a sheep is attacked with this species of *sturdy*, it ceases to improve, becomes dull, is apt to loiter behind, and separates from the flock. It does not walk straight forward, but often deflects to one side, or dozes round in a circle. The eyes glare steadily in its head, and seem enlarged, from the pupil being round instead of oval, which in healthy sheep it always is in the day time. Its vision is impaired, and it does not see any object which approaches it until it be very near, when it starts away,

and runs furiously without any aim. When caught, it is remarkably stupid on being again liberated.—In dry weather it follows eagerly to that quarter from which the wind blows. It has a great reluctance at passing water, and burns, and cannot easily get through it, but mostly frequents places where it can hear the sound of water. Some time after these symptoms appear, in the course of perhaps three weeks, on examining the head by pressing with the thumbs, a remarkable degree of softness is found at one part of it where the scull seems to be wanting. In a few instances no softness is to be discovered in any period of the disease; but in either case, if not relieved by operation, the animal loses the power of standing, and dies perfectly emaciated. The duration of this variety of the disease extends from two months to a year.

Variety 2d. There is, however, another variety, much more rapid in its progress, in which a great degree of stupor comes on in a few days, followed by total blindness, and no softness is ever to be found in any part of the scull.

Appearances on Dissection.—Variety 1st. On opening the head in the first variety, an oval or round bag is found, lying between the brain and the scull, quite unconnected with any of the surrounding parts, generally situated between or beneath the horns. They vary much in size, being sometimes no larger than a plumb, at others as big as a goose's egg. They are filled with a clear fluid like water, sometimes intermixed with a thin cruor, when it is of a glutinous or slimy na-

ture. Within, or in the skin of this bag, are seen, according to Mr. Beattie, some little white bodies, like nits. These are more particularly described by Mr. W. Hog in the following passage, which, although blended with some hypothetical notions, is highly creditable to his talent for accurate observation. "Two or three recent observations induce me to believe, that the dissolution of the brain, &c. is occasioned by numbers of animalculæ, which I have observed swimming loosely in the liquor.—They resemble ant's eggs, both in shape and colour, but are somewhat shorter. But as all the animals upon which I made the observation had been dead for some time, so these puny inhabitants of the brain were dead also; but if they had been living and organized animals, which I have no doubt they were, there would be multitudes of so diminutive a size as to be quite imperceptible to the naked eye; and am fully convinced, that if the disease was minutely observed in all its stages by microscopical observation, that, whatever its beginning was, its progress would be, by the activity of these *animalculæ*, increasing both in number and size." In proportion as the disease advances, the bag increases in size, and by its pressure causes the brain to decrease, while the scull, immediately over the bag, becomes soft, and disappears, so that nothing intervenes between it and the integuments of the head. Sometimes, but only in those cases where no attempt has been made to cure it, there are many small bags, unconnected with each other, distributed through the brain.

Variety 2d. In the second variety the water is not

contained in a bag, but within the substance of the brain, in certain cavities called its ventricles, and sometimes in the hinder parts, where it joins with the spinal marrow, in which case it is quite incurable.

Hard substances growing from the inside of the scull, or blows upon the head, occasionally produce all the symptoms of real *sturdy*, but in these cases no water is to be found.

Causes of Sturdy.—The cause of the symptoms is undoubtedly pressure on the brain, whether it arise from accidental contusion or a bony excrescence, as in false *sturdy;* or from a collection of water, as in the two legitimate varieties. What, however, gives rise to these collections of water is not so well ascertained. Inflammation of the brain probably precedes its effusion in the second variety; but the generation of the hydatids in the first is not at all understood. The disease is not contagious; neither is it peculiar to any soil. It generally affects hogs in the months of April, May, and June, and is commonly ascribed to exposure to tempestuous weather, without sufficient shelter; at least, in a well-sheltered flock few are affected by it, and a clothed sheep never. Some kinds of sheep are extremely predisposed to it, and will relapse again after having been cured; and horned sheep are specified by Mr. Singers as being most liable to it.

Cure of Sturdy.—The natural termination of this disease is invariably fatal, unless we except those rare recoveries which sometimes are the consequence of accidental blows in the head, probably rupturing

the bag. Therefore, and more especially as the mutton in this disease is good, the sooner an attempt is made to relieve the animal by operation the better; and although it is extremely simple, and not unfrequently successful, thousands are suffered to perish through carelessness or ignorance. The cure may be attempted in three ways, by tapping, trepanning, or wiring.

1. *Tapping.*—"If the bag be seated any where in the crown of the head," says Mr. James Hog, "the gentlest way is to tap it in the place where the scull is soft, and let the water run out. This is commonly performed with an awl or large corking pin, although an instrument with a small tube in it (a small troca) might easily be made which would drain it off more completely. By this operation, if the instrument is not pushed too far, the animal is nothing the worse, whether it recover or not. But what is very remarkable, this plan is not successful on all farms alike, of which I have known many instances. There is an old shepherd on the farm of Mountberger, named William Cowan, whom I have often heard observe, that in a course of thirty years' experience, not one sheep out of twenty which he had tapped on his own farm had died, while it was very rare that he could cure any on some of the neighbouring farms. He performs it always with a corking pin." Mr. Laidlaw also says, that in his neighbourhood, more have been cured by this operation than by any other; and he advises the sheep to be laid on its back and the pin to be inserted obliquely; if water follow, the cure is certain, but even al-

though it should not follow, provided the bag be pricked, it is often successful.

2. *Trepanning and Extraction*.—This has been so well and circumstantially described by Mr. Stevenson, that it is only necessary to transcribe what he has said of it.

"The animal being properly secured, and the head placed in the most convenient position, having the part to be cut uppermost, the skin is to be divided by an incision an inch and a half long, crossed by another of the same length, at right angles to it. The scull, which is quite soft, is now to be cautiously divided in the same manner, till the bag with the fluid appear clear at the bottom of the incision, which it commonly does. The soft scull is now to be turned back, or a bit cut out of it, so as to render the bag completely visible. It should be taken hold of by a pair of blunt forceps, and gently moved backwards and forwards, to loosen it from its connections, which are generally very slender. This may be also done by a crow-quill, or any blunt-pointed instrument, carried frequently round it.

"The nose of the animal is now to be held so as to restrain its breath, which forces the bag from its situation. The operator should continue moving and pulling it, stopping the breath at intervals, till it is quite extracted. The skin is then to be laid neatly down again, and a tarry cloth tied over the wound above the dry lint, which is folded and laid on it, to prevent either cold in spring, or flies in summer from injuring it. This should be allowed to remain for two days, when the dressings may be changed,

and a bit of cloth spread with hog's lard, fresh butter, or tar applied on the wound. The dressing should be changed every second day, for ten days or a fortnight; after which time, in ordinary cases, it will require no more attention, being generally healed up. The scull grows over it in about a month, and then becomes of its usual hardness; and the animal is equally healthy, as if no disease had previously existed.

"The senses, after the operation, return in a few hours, and next day they seem to be quite relieved.

"If by rashness or inattention the bag containing the fluid has been ruptured, which sometimes happens, it is very difficult, in many cases impossible, to extract the sac. The best practice in this situation of things is to place the animal in such a position as that all the fluid may run out. Wash the wound with spirits, and try to extract, if possible, the remains of the sac; then dress it with a mixture of *tar* and *basilicon*, or either separately, and turn the animal (which has now lost its stupid appearance) into good pasture. The damps and cold of night should be avoided, as they tend to produce inflammation, which very soon destroys the animal. In this case the admission of the external air, and the irritating dressings, make the sides of the sac adhere. This, however, is not always the case, as I have known after a week or two the symptoms return, after the alleviation which the operation always produced.—When this happens, it is almost impossible to extract the bladder entire, on account of the inflammation from the cutting causing strong adhesion. In

this case the bag may be opened, and a little spirits or port wine injected with a syringe, which I have known in more than one case prevent a return of the symptoms. This operation should not be performed in very warm weather, as maggots are extremely apt to breed in the wound. In frost inflammation is apt to be produced, which must also at that time render it improper. In these cases they should be fattened for the butcher as soon as possible.

There is a slight variation in the manner of performing this operation, noticed by Mr. James Hog, as practiced by Mr. Laidlaw, of Willenslee. It consisted of burning a small hole through the soft part of the scull with a hot iron, and taking out the bag entire with a small hook; but Mr. Hog does not approve of it, as Mr. Laidlaw cured only about every fifth sheep on an average.

To this mode of operating is also to be referred the breaking off the horn under which the disease is supposed to lie, when no external softness is to be discovered.

3. *Wiring.*—This remarkable operation is so accurately described by Mr. James Hog, that it will be only necessary to quote what he has said of it.

"But if the scull feel soft in the forehead, then the operation must be performed by thrusting a stiff sharpened wire up each nostril, until it stop against the upper part of the scull. If this cure were not well authenticated by daily observation, it might seem a very severe and dangerous operation, as the wire goes quite through the brain in two

different places; yet a far greater number are cured by this way than any other. I have cured numbers both ways, and killed a part too; but those that I killed were generally with the wire, because if the other fails of the desired effect, the wire is always applied to as a last resource; and many have I seen cured by it, which were to all appearance quite past redemption.

"When I was a youth I was engaged for many years in herding a large parcel of lambs, whose bleating brought the whole sturdies of the neighbourhood to them, with which I was everlastingly plagued; but as I was frequently weaving stockings, I fell upon the following plan: I catched every sturdied sheep that I could lay my hands on, and probed them up through the brain and nostrils with one of my wires, when I beheld, with no small degree of pleasure, that by this simple operation I cured many a sheep to different owners; all which I kept to myself, having no authority to try my skill on any of them, and it was several years before I failed in one instance. If the sturdy is not at all to be felt by pressing with the thumbs, it is either seated in the centre of the brain or behind, and nothing can be done for them except with the wire. I have always observed, though I cannot well account for it, that on being wired a sheep is sick, in proportion to the stiffness of the gristle below the brain. If there is much resistance it is always very sick, but if the wire goes easily up it puts the sheep little off its ordinary. When one is wired it is proper to take hold of it with both hands, behind the ears, and shake its head

loosely. This empties the bladder, and the water must find its way by the nose afterwards, for they will frequently grow quite better, though none be seen to issue from the nostrils at that time. It makes them sick for the present, but they are more apt to amend afterwards."

This singular operation is also prepared as the safest and most successful by Mr. W. Hog and Mr. Scott, who say that after they are wired, sheep will lie as if dead for hours, sometimes a whole day, and still recover.

Staggers.—" This is a disease seldom or never affecting the sheep in this country, those excepted who feed in forests or amongst planting. The symptoms of it are more violent than those of sturdy during the time of their continuance. The animal after staggering for some time falls on the ground, when a general trembling comes on over the limbs; they are violently convulsed, and quite insensible to every thing. During the continuance of the paroxysm they throw the body into various positions, and sometimes roll to a considerable distance. The fit continues for a quarter, sometimes half an hour, or an hour. When they rise they seem perfectly bewildered till they regain the flock, when they continue to feed well till another paroxysm supervenes.

" This disease appears in autumn, and various causes are said to produce it. Improper food, the leaves of the oak, from their astringent quality,* cobwebs sprinkled with dew, have all been reckoned as

* Anderson's Recreations, Aug. 1790.

causes. I am inclined, however, to suppose that it arises from the action of a poisonous grass (*Lolium temulentum,*) which is the only one of that description in this country, and grows only in those situations where staggers prevail. What effect these causes have on the brain, to produce this disease, I cannot explain.

"When it continues for any time on the same individual it is apt to be fatal. Change of pasture is the only effectual cure for it." Mr. Stevenson.

Pinnig, Daising, or Vanquish.—This disease, as described by Mr. James Hog and Mr. Beattie, is also most severe upon young sheep, but is chiefly confined to some particular districts in the west of Scotland, where the land is very coarse, hard, dry, and heathery. It always fixes on the best of the flock, and although they continue to feed most greedily, they daily pine away to a mere skeleton. It it fortunately not a dangerous disease, for on removing them to soft grassy pastures, especially such as have been recently limed, they immediately recover and never fail in future to become excellent sheep, and remarkably healthy. Although in regard to the gradual wasting of the animal, this disease has some resemblance to the rot, in its nature and cause it is directly the reverse. The rot arises from excess of moisture, is a disease of debility, and characterised by extreme thinness of the blood; in the pine, on the contrary, the condition of the animal is too high, its blood too thick, and its pasture too arid.

The following description of the vanquish, by Mr. Singers, however, is so different from the

above, that it scarcely appears to be the same disease.

Peat mosses, having a northern or eastern aspect, are unsafe pastures for young sheep after the autumnal equinoxes; if there be not other soils on which they can occasionally feed, and especially if the season be cold and moist. These farms which consist wholly of peat moss, are not well adapted to carry on ewe and lamb stocks throughout the year. I have known of such farms that could not without difficulty, be let for sheep walks, unless to such farmers as had command of drier sounder pastures, to which they could remove their sheep at the proper season. Without this resource the young sheep were attacked by the vanquish, which consumed them entirely away. This malady has its seat, as practical shepherds believe, chiefly in the blood and bones; but it seems in a little time to spread over the whole system, which becomes debilitated and emaciated. Cold and moisture assist in bringing it on, and also aggravate the symptoms; but there must be a principal fault in the mossy soil.

"The earliest common pastures for sheep in spring are peat mosses. The bog cotton, *Eriophorum*, flowers as early as April, and gives the first food of the season to sheep and bees; the sheep drawing the white stalks, and the bees finding pasture on the flowers. Mosses are therefore of importance to the sheep farmer at this early season of the year. They also furnish a considerable quantity of summer food, principally from the plant called *Scirpus cespitosus*, deer's hair; but early in Au-

gust this plant becomes wiry and unpalitable. There is then frequently heath in the mosses, but it does not appear to be so grateful to sheep as that of the dry moor, or a gravel bottom. The heath of mosses has been found not to grow so kindly after being burnt as that of drier gravelly soils, and therefore is either scanty, or woody and rigid for the most part. These defects in the heaths of mosses may be in part occasioned by neglect: they are suffered to be too old, ere the torch is applied, and afterwards when burnt they die from the roots; but the excessive moisture frequently puts it out of the farmer's power to manage his moss heaths as judiciously as those of his moors and gravelly soil. And the same excess of moisture may probably affect the qualities and healthiness of the heath as food for sheep. There is also in peat mosses a greater proportion of cross-leaved heath, *Erica tetralix*, than we find on dry walks; and most people seem to think, that the sheep do not relish this sort of heath so well as the common heath, *Erica vulgaris*, when the shoots are young.

"Change of pasture, from the peat moss to one that is sweet and dry, at or before the equinox, till March following, is the best known cure for the vanquish, and seldom fails to prevent it."

*Diarrhœa.**—The early grass of soft and tathy pastures, and such as are subject to be inundated through the winter and spring, which is eagerly sought after, and greedily devoured by animals,

* Diarrhœa or Dysentery, Mr. W. Hog. Purging or Rush, Mr. Stevenson. Diarrhœa, or Rush, Mr. Laidlaw.

worn out by the fatigue and hunger of the preceding winter, is apt to produce purging among the hogs, and if they be lean, among the dinmonts and eild gimmers. Its appearance and progress are determined by the forwardness and wetness of the season. It commonly begins in April and ceases in June, when the grasses in general become firmer and less succulent; and among the great variety which then appear, there are some of an astringent nature. In general the animal begins to thrive as soon as the cause is removed, and seldom experiences a relapse the same season. In some instances, however, it continues for a great length of time, but is rarely fatal, unless the animal has been previously much debilitated.

On opening the body the bowels appear white and bleached, but in some places streaked with red. As well as the stomach, they are generally empty, containing nothing but air. When the disease has been severe, or long continued, the internal coat is sometimes abraded from the intestines, and even from the fourth stomach. The carcase is completely emaciated, no fat being found on the bowels, or even in other parts, or at least it has lost its unctious nature, and is converted into a whitish tough substance.

On other occasions purging is not only produced by cold, but also by change of food, from wholesome and dry to damp and soft pasture, or from poor and sterile situations to those that are rich and fine. At times, also, it is the consequence of other diseases, such as collections of matter, sickness, jaundice, &c. and often removes them.

Astringents might be employed for the cure of this disease, but seldom any thing else is administered but sweet milk, whose costive and nutritive properties, stopping the rush, and invigorating the debilitated system, a cure is speedily performed.

All kinds of grasses which grow on a mossy soil are possessed of strong antiseptic qualities, and of course are exceedingly useful in preventing sheep from being attacked with this disorder.

Mr. Stevenson alone is more particular in his observations on the cure of this disease.

"When the disease arises from cold, (which may be known from the state of the weather,) putting the sheep into the house for a few days, and feeding them on dry hay, will speedily prove a cure.

"When it arises from too rich pasture, they should only be admitted to it for a certain time of the day, and put into a pen at night, with some dry hay to eat, or turned into hill pasture. This should be attended to by graziers having rich pasture who at times lose a considerable number from this cause alone. When once they are gradually accustomed to this food, the hay and other precautions become unnecessary. Where looseness depends on damp or wet grass, or wetness in the spring season, a little dry hay given at night in the fold has a good effect in checking it.

"We come now to speak of that kind of purging which depends upon weakness and relaxation of the bowels, and in which alone the aid of medicine is necessary.

"In this kind of purging the sheep should have

as dry pasture as possible, and even a little hay mixed with it. It is in general advantageous, in the first place, to clear the bowels from any irritating matter by a dose of an ounce of glauber's salts, or the same quantity of common salt; after which the indication is to bind up the bowels by astringent medicines, and prevent the return of the disease, by using such medicines as are calculated to strengthen the bowels.

"Sometimes, as was before mentioned, a purging is a consequence of fever, &c. In which case it is critical and ought not to be stopped. In cases, however, where it is weakening the body greatly, and depends on laxity of the bowels, we must have recourse to the medicines we have recommended in a particular stage of braxy.

Take of logwood 1-4 lb.
Water 2 lbs.

Boil it into one pound, and add a little cinnamon. A gill of this to be given morning and evening. If this in eight days have not the effect of carrying off the disease, add to every dose ten grains of powdered Japan earth *(extract of Catechin;)* these, from their astringent quality, prevent the frequent motions of the bowels.

"Twenty drops of laudanum form a valuable addition to every dose, when the rumbling and noise in the bowels is excessive, or when the disease has continued long.

"We may take notice in this place of what is denominated by shepherds the *black purging*, which is generally the consequence of some previous dis-

case, as rot, braxy, sickness, &c. It proceeds, like the black vomit in the yellow fever, from mortification having taken place in the bowels, and part of their coats coming away, mixed with acrid and thick *bile*. It is always fatal, and the sheep should be killed as soon as it appears, to preserve the carcase, which in this disease, notwithstanding it is bled, has a disagreeable smell, and the flesh is quite soft.

"Sometimes it proceeds in harvest from the heat causing a redundancy of bile; but even in this case it is always fatal, as the constitution of the animal receives such a shake as it never recovers."

*Dysentery.**—This disease is in every respect analogous to the dysentery in men; arising from similar causes, being attended with similar symptoms, and yielding to similar remedies.

It is not peculiar to any soil, but appears most frequently, and spreads most rapidly, where the pasture is soft and grassy. It is always generated by improper management, such as working among the flocks inconsiderately in sultry weather, and in crowded folds. "It most frequently breaks out," says Mr. Beattie, "in milking-time, when the sheep lie for six or seven weeks in the warm months of July and August upon the same spot for some time, morning and evening at the bught. Indeed, when sheep, from whatever cause, lie upon the same spot till the ground turns foul, if the weather is soft, sultry and warm, with thunder or thunder showers,

*Dysentery or Cling, Mr. Singers. Dysintery or Braxy, Breckshaw, &c. Mr. Beattie, Mr. Stevenson, Mr. Laidlaw, Mr. Welsh. Breakshuach or Cling, Mr. J. Hog, Mr. W. Hog.

dysentery* is much to be dreaded, and it is epidemical beyond example."

When a sheep becomes affected with this disease it acquires a sickly look, its ears drop, and hang low down, its eyes are languid, and its wool claps to the body. For some time it continues to follow the flock, but generally stands in one position looking to the ground. It often lies down, but soon rises up again, and walks to a short distance, during which it commonly voids fœces. Its skin is hot, dry and scaly, and its pulse and respiration quick. It eats very little, and does not chew the cud, but seems to have an unquenchable thirst. There is frequent rumbling heard in its bowels, followed by the passage of fœces, which are thinner than ordinary, having little or no resemblance to the hard purl of healthy sheep. As the disease advances the purging increases, the discharge becomes thinner, and mixed with blood, then slime and blood, and at last it is black and fetid, evidently accompanied with severe gripes and straining. After a wet summer the discharge is frequently green, the grass appearing to pass with little change of colour. In the mean time the animal rapidly wastes away, being reduced in a day or two to a perfect skeleton, with its belly drawn up to its back; it separates from the flock, wanders unsteadily about, and hides itself amongst fern or heath. Its eyes are suffused with red, its breathing becomes more laborious, an unpleasant smell exhales

* In this and other quotations, I have taken the liberty to substitute *Dysentery*, for the author's term *braxy*, which by many is used to denote a very different disease, the *Sickness*, and might thus lead to mistakes.

from every part of its body, its fœces are absolutely putrid, it is quite overcome by the disease, and it continues straining and purging till it dies.

If a sheep survives the disease a fortnight, Mr. J. Hog says four days, it generally recovers. In this case, there is either very little or no blood in the fœces, the slime dries up and is mixed with hardened balls, the feverish heat abates, the skin becomes moist, the vigour of the eye returns, the appetite increases, and the wool rises slowly, and assumes its natural appearance, but great part of it frequently comes off. It however, grows on again, and sheep which have had the dysentery generally become very healthy and sound, and are seldom attacked by any other disease.

Sometimes the flux never breaks out at all, but the fever and other symptoms are the same. This is called the *dumb braxy*, and is neither so fatal nor so epidemical as the other, although, when they recover, the wool drops off in the same manner.

Although the dysentery is always originally generated by improper management, it is highly contagious, and spreads rapidly from individual to individual, and from flock to flock, "so much so," says Mr. Beattie, "that if a flock which is much infected with the braxy lies between a sound flock and the wind, although at half a mile's distance, the sound flock will catch the infection. For which reason all the neighbouring shepherds are greatly alarmed when the dysentery breaks out, as their flocks often catch the infection, notwithstanding all their efforts to prevent it."

It is a very dangerous malady. On a soft soil the greater number of those infected with it die; but on a dry hard soil it is less fatal, and less contagious.

Appearances on Dissection.—The carcase immediately after death has a peculiar unpleasant smell, and is commonly distended with air. On opening the body, the fat of the omentum seems to be wasted away or to have acquired a reddish colour, and there is a general redness diffused over the whole contents of the abdomen. The veins of the mesentery are remarkably turgid. The stomach and bowels are filled with fetid air, but contain no fœces, except a little slimy matter. The intestines, especially towards the anus, are often livid, thickened, and ulcerated on their internal surface. The muscles soon become green, and do not lose their unpleasant flavour even when salted. The subcutaneous and muscular fat is less wasted than might have been imagined.

Diagnosis.—Dysentery is distinguished from ordinary diarrhœa, by the following characters. 1. Diarrhœa attacks chiefly hogs and weak gimmers, and dinmouts; whereas dysentery is frequent among older sheep. 2. Diarrhœa almost always occurs in the spring, and ceases about June, when dysentery only commences. 3. In diarrhœa there is no fever or tenesmus, or pain before the stools, as in dysentery. 4. In diarrhœa the fœces are loose, but in other respects natural, without any blood or slime; whereas in dysentery, the fœces consist of hard lumps passed occasionally, the rest being blood and slime. 5. There is not that degree of fetor in the fœces in

diarrhœa, which takes place in dysentery. 6. In dysentery the appetite is totally gone, in diarrhœa it is rather sharper than usual. 7. Diarrhœa is not contagious: Dysentery highly so. 8. In dysentery the animal wastes rapidly, but by diarrhœa only a temporary stop is put to its thriving, after which it makes rapid advances to strength, vigour, and proportion. 9. Dysentery is commonly fatal, diarrhœa rarely, unless the animal has been previously much debilitated.

The *dumb braxy*, as it is called, is distinguished from sickness by the season of the year in which it appears, and by dysentery in its common form of a bloody flux, affecting other individuals in the same flock at the same time.

Means of Prevention.—"The precautions which skilful farmers use to prevent the appearance of this disorder, are of far more benefit than any thing that can be done after the disease is broken out. They endeavour to allow their sheep to pasture easily and freely, and to *skail* them, as we term it, as equally upon the ground as possible, so that no one part of it, by their gathering in bulks, may be tainted or foul. In milking-time they choose a high airy situation for their bughts, where they have a free current of air. Dry bent ground is reckoned the best for a bught, where the surface is not easily broken, and they shift the bught frequently before the ground turns foul, to keep the sheep clean, and to prevent any smell. They divide their sheep into equal bughtfuls, for the most part counting them, so that they may never get a heat by being too throng,

which is apt to make them nist, that is break out in a flux, which taints the ground. They change the places where they lie, when at the bught, before it grows foul, and when the situation of the ground will permit, they sometimes shift their bughts to another quarter."

"When the disease appears, we remove those that are infected among them, as speedily as possible, to a considerable distance, and put tar upon the noses and roots of the tail of every sheep, and set a tub of tar down at the bught, stirring it occasionally. This we do from the persuasion that it may stop the infection, as men use sulphur and vinegar with the same design. If the disease still rages, we smear or salve a number of them, and let them go from the bughts to a clean pasture, and lie at their ease. This, for the most part, makes it abate, but sometimes they continue dying, even after they are all smeared, until the frost sets in, and then it subsides, after a great loss."

Cure.—Farmers in general attempt to cure the dysentery in sheep, by taking them into the house for twenty-four hours, giving them Peruvian bark and laudanum, in as little cold water as possible, and then confining them in an inclosure where they can get no water. If the flux continues, and the animal lives, the same process is repeated every two or three days, till the flux stops; but it is long before they are allowed to rejoin the flock, lest they should still communicate the disease. This method of treatment, however, they confess is not very successful, and with a candour much to their credit, look up to

medical men for pointing out to them a mode of treatment which may be more efficacious, in consequence of its analogy with dysentery. As Mr. Stevenson combines in himself the qualifications of surgeon and farmer, his opinions are entitled to particular attention. If the sheep are in good condition, and the weather rather cold, the cure may be begun by cutting the tail across. Stoving the sheep in a hot-house, or heating them in such a degree as to bring on perspiration, is attended with great advantage. This is more easily effected when they have previously bled, and if it be copious and general it seldom fails to carry off, or at least greatly to relieve, the disease. Care, however, must be taken not to expose them suddenly to the common temperature of the atmosphere, lest the cold occasion a relapse. At the same time it will be necessary to clear the bowels by an ounce of glauber's or common salts, or half a drachm of rhubarb, or, what is better, four grains of ipecacuanha repeated every two hours till it purges freely. Should the other remedies not operate in four hours, the dose may be repeated. The next indication is to sheath the bowels, by giving a quantity of thin flour porridge well boiled, and barley meal or oat meal may be used in the same way, along with half a mutchkin of sweet milk, morning and evening.

If these do not succeed after being used for two days, various astringent medicines may be used, with a view to check the preternatural determination to the bowels, and diminish their increased action.

Take of logwood, 3 oz.
Boiling water, a Scots pint.
Allow it to stand 12 hours, and then give a gill morning and evening; or,
Take of oak bark, 4 oz.
Boiling water, a Scots pint,
Infuse for 12 hours, and give a gill twice a day;
Take of Japan earth in powder, 1 oz.
Boiling water, a chopin,
and give a gill twice a day; or,
Take 2 oz. of chalk,
Boiled in a chopin of milk,
and give one half in the morning, and the other half at night.

Fifteen drops of laudanum are a very necessary addition to all the foregoing receipts. Given to the extent of thirty drops a day, it is attended with very excellent effects, as it lessens the pain in the bowels, and prevents, during the time of its action, their violent motion. It has also an effect in lessening the frequency of the stools, which cannot take place when the motion of the bowels is retarded. If none of the others can be had, it may be given by itself, fifteen drops three times a day, after the bowels have been cleared by a purge, in the way already mentioned, as will be exemplified by the following cases."

Cases of Dysentery. Drawn up by Mr. Stevenson.

Case I.—On the 12th of August, 1800, a sheep was observed by the shepherd to be affected with braxy. It was brought home, and put into an inclosure at the back of the house. The wool was not clapped, but the eye was languid; the mouth dry,

the skin rough on being felt, frequent rumbling was heard in the bowels, the pulse, felt at the neck, was quick. It had frequent stools, which had a slimy appearance, and were mixed with blood; and a few hard balls were observed to come amongst some of the stools, at each of which it drew up its hind legs, and seemed to suffer pain. As it was in good habit of body, it was bled in one of the veins in the fore leg, and about two ounces of blood, of a dark colour, taken from it. A dose of an ounce of salts, was then administered, which in eight hours produced several passages, and the pain in the bowels seemed in some measure to be abated. Next day five grains of ipecacuanha were given every two hours, for five hours, which still kept up the purging; and considerable sickness was apparent. In two hours after the operation of the ipecacuanha, it began to eat a little and the skin was somewhat moist. The frequent stools now abated, and there was no more purging, nor was any more blood passed. In six days it was so far recovered as to be able to join the flock.

Case II.—On the sixteenth of the same month, 1800, a sheep was brought home, in which the disease had continued for several days. The stools were very frequent, slimy and mixed with blood, having little feculent matter in them; the wool was clapped, the mouth and skin dry, the eyes languid and red, constant rumbling in the belly, and the animal could with difficulty stand. On laying the hand on the belly it could be felt in some parts as it were drawn together, and lumps in parts of it. A dose of

half a drachm of rhubarb was given to it, which operated in eight hours, several times, and brought away a quantity of fœces, more of the natural appearance, only thin; and next day, eight doses of ipecacuanha were given every two hours. The purging continued, but not so much blood nor slime, for two days, at the end of which four ounces of logwood were taken, upon which was poured a Scots pint of boiling water. When it had stood for twelve hours, a gill, or four ounces of the infusion was given, morning and evening, having 15 drops of laudanum added to each dose.

In six days the stools had ceased in their frequency, and the feverish appearance was gone off, and the animal had begun to take its food. From this time there was nothing more done to it, and in twelve days from its first being brought home it was returned to the flock.

Case III.—In the month of September, 1800, a sheep was brought into the inclosure, from a neighbouring farm, the proprietor of which had before witnessed the successful treatment of the other two cases. The disease had continued twelve days, and the animal was very much exhausted. The wool was clapped, and a very considerable quantity of blood was passed at each stool, the mouth and skin were dry. It took no food, and the pulse was quick. A dose of salts was given to it, an ounce, which operated well. Next day four doses of ipecacuanha were given of four grains each, which also operated, and by which the purging stopped for six hours. There was no appetite; and a number of hardened

pieces of fæces were passed, mixed with black blood. The heat of the body continued. Two ounces of logwood were infused in a chopin and a half of water, and given in the quantity of a gill, three times a day, with the addition of fifteen drops of laudanum. This was continued for four days, during which time, however, the blood still continued to be passed, with an admixture of a substance, like the matter of an ulcer; and on the 17th day from the first attack the sheep died.

On looking into the belly, the bowels had all an inflamed appearance, and a considerable proportion of the lower intestine was ulcerated in the inside; its coats were thickened, and its outside was of a blaskish hue. There was a quantity of fetid air in the bowels, which turned a silver probe quite black, as it did also a shilling exposed to it. The flesh was soft and red, but the heart, liver and brain were sound; the kidneys were slightly enlarged and flabby.

Case IV.—In August, 1800, a sheep was brought home affected with braxy, the symptoms were as formerly described: it seemed much exhausted, and had been observed affected for seven days. It got first, four grains of ipecacuanha, every two hours, for three times, which purged it a good deal. It was then placed in a small house, where was a large cast-iron boiler, which being filled with water, and the door shut from the heat of the furnace below, it soon filled the whole house with steam, in which the sheep continued for the space of three hours, when the fire was taken away, and the sheep remained in

the heated house all night. There was a great perspiration over its body, and the wool was quite wet. It was taken out at mid-day, and the infusion of logwood and laudanum given to it three times a day.—It seemed a little better, and the stools not so frequent. Wool still clapped. Next night it was shut up, and stoved again, and some flour porridge was given to it, with a little milk. Next day the medicine was continued. The symptoms had abated, but the wool clapped. It was not again stoved, and the medicines were continued for twelve days, before it was quite recovered.

Case V.—In this case the treatment was the same as in the first and second cases; but there was such a degree of debility that the porridge and astringent medicines were continued for nearly four weeks before it was recovered.

Case VI.—In August, 1800, a sheep was brought in with braxy, the symptoms very violent. It had a dose of salts, which operated, but it died next day. In this case the bowels were affected considerably higher up, being at the junction of the small and great guts, where mortification had taken place.—The lower bowels had a number of round hardened balls in them, and a very disagreeable smell was exhaled.

I deem it unnecessary to mention any more cases, which all occurred in the same year, as braxy has not appeared since 1800; and I have had no opportunity of making experiments upon it since that time. The practice in that year was very successful, as five were saved out of seven that were brought home,

and a fair trial instituted: but from carelessness, nearly one out of three died before any thing was done to them.

Scab, or Itch.—This disease is only known by name, over a great part of Scotland, but even in the most distant Highlands and Hebrides, it has of late years made considerable depredations.

The infected sheep become restless, and instead of feeding quietly, tear off the wool with their teeth, and go in search off stones and banks, against which they may rub themselves. The skin, when narrowly inspected, has a red fretted appearance, and emits a peculiar ichor, which hardens into scabby crusts. These fall off, and are succeeded by others still larger. The wool gets a dirty brownish appearance, and falls off prematurely, and the animal ceases to grow, or loses flesh, and pines away; and if not cured by medicine, at last sinks under the continual irritation and poverty occasioned by it.

It is highly contagious, and when once introduced into a flock lessens its value more than one half, by very quickly infecting the whole, not so much by direct contact, as by means of the rubbing places; so much so, indeed, that when to get rid of it whole flocks have been exterminated, the disease has sometimes appeared in fresh flocks laid on their pasture, in consequence, probably, of infectious matter or animalculæ still adhering to the stones or banks, or other rubbing places.

But it may also be brought on by poverty and overheating, or by making them lie too close together during the warm summer months, or by lying

under the drop of trees. Spring, however, is the most critical season for it, and the same soil, grass and weather which induces the rot, are also considered hurtful in the scab.

It is never generated in flocks which are salved or smeared with butter or tar, which was universally the custom in Scotland. But salving does not prevent its being introduced by infection.

The white faced, fine woolled sheep, are most liable to it. Hogs or young sheep are its most common subjects; and in a flock, the rams, which are naturally slovenly, indolent, and foul-feeding, are usually first affected.

As soon as it is discovered, the utmost care is necessary to put a stop to its progress, by removing or killing those suspected of being infected, and salving the others if the season permit.

The scab is, however, by no means an incurable disease. Mr. Stevenson recommends a teaspoonful of sulphur combined with treacle, and diluted with water, to be given them for some mornings, while all the parts affected are carefully rubbed every night, for five or six times, with one or other of the following applications:

Take of sulphur, three ounces,
Tobacco liquor, a chopin, (two pints English.)

Put them on the fire till they boil, and use it when cold. This is similar to an application of some of the South Down farmers, viz. a decoction of tobacco, wild wine root, and sulphur, boiled in brine for a quarter of an hour, strained off, and poured on

the affected parts, separating the wool.

Take of tar, a pint, (four pints English,)
Butter, two pounds.
Mix them well.

Take of sulphur, half a pound,
Butter or lard, two pounds.
Mix them well.

Mercury, however, is by far the most effectual remedy, although attended with some danger. The following is Sir Joseph Bank's method of applying it:

Take of quicksilver, one pound,
Venice turpentine, half a pound,
Oil of turpentine, half a pint English,
Hog's lard, four pounds;

rub the quicksilver and Venice turpentine together in a mortar, until the globules of mercury disappear, then add the oil of turpentine and hog's lard, and mix for an ointment.

Apply the medicine, if possible, in dry weather, in the following manner. Begin at the head of the sheep, and proceeding, from between the ears, along the back to the end of the tail. The wool is to be divided in a furrow, till the skin can be touched, and as the furrow is made, the finger, slightly dipped in the ointment, is to be drawn along the bottom of it, where it will leave a blue stain on the skin and adjoining wool. From this furrow similar ones must be drawn down the shoulders and thighs, to the legs, as far as they are woolly; and if the animal is much infected, two or more should be drawn on each side, parallel to that on the back, and one

down each side, between the fore and hind legs. Immediately after the application, the sheep are turned out among the rest of the flock, without fear of infecting it, or of sustaining injury themselves. The blotches dry up, and the sheep are cured in a few days. In Lincolnshire the farmers used to anoint their sheep with it when they came home from the common, whether sound or not, and persons contracted to apply it effectually at five shillings per score of the large sheep of that country. Instead of the above, the common mercurial ointment of the shops may be used, and some shepherds rub the parts affected only, others the naked parts of the thigh and leg, and others apply it by tying a worsted cord, well soaked with it, around the neck.

Redwater.—" This disease commonly makes its appearance about the beginning or end of winter, and first affects about the breast and belly, although at times it spreads itself over other parts of the body. It consists in an inflammation of the skin, that raises it into blisters, which contain a thin, reddish, and watery fluid. These continue for a short time, break, discharge their matter, and are followed by a blackish scab.

" When the sheep are exposed to cold or wetness, the skin being fretted, makes the blisters rise, or they often arise from cold, affecting the animal internally, thus producing a slight fever, which throws out these vesicles on the body, similar to the scabby eruptions which appear about the face, and more particularly the mouth, of those persons affected with cold. The blood, in this disease, is but little af-

fected, although a little of it oozes into the vesicles on the skin, and communicates to them that reddish tinge which gives origin to the name.

"Redwater is a disease that but seldom appears in this country, and is almost never fatal. In cases where the disease is violent, a little blood should be taken in the manner described. The sheep should be placed in a fold by itself, the blisters slit up, and a little infusion of tobacco put into them; and the following medicine may be given for three or four mornings, successively:

Take of flower of sulphur, 2 oz.
Honey, treacle, or syrrup, 3 oz.

Mix them and divide them into six doses, of which one may be given every morning, in half a pound (half a mutchkin) of warm water. If this is found unsuccessful, half an ounce of nitre mixed with the foregoing receipt will be attended with good effects; after which a dose of salts may be given, and the body washed with lime-water upon the parts affected."—Mr. Stevenson.

Erysipelas, or Wild Fire.—"This, like the last mentioned disease, also affects the skin, and is apt, if not attended to, to spread very quickly among the flock. It is attended with more inflammation than the last; and but seldom with blisters over the body. It commonly appears in August and September, and does not continue above eight days at a time, although those sheep once affected with it are liable to relapse. In former times it was a practice with shepherds to bury those sheep affected with this disease at the door of the fold, with their feet up-

wards, which they believed acted as a charm to drive it from the flock. This, however, is now disused.

"It is necessary, for the cure of this disease, to follow the same method recommended in the red-water. An ounce of salts, dissolved in warm water, given every morning for three or four days, answers remarkably well to begin the cure, when the last mentioned receipt, with the addition of the nitre, may be continued till the disease disappears." Mr. Stevenson.

Foot Rot.—This disease appears in August, and is more frequent among long than short sheep. It seldom occurs in clean walks, but is very troublesome on dirty soft pasture. It is frequently occasioned, in the milking season, by the bughts being dirty, and by the sheep being confined in old houses. It resembles the whitlow, and it commonly affects the fore feet, but sometimes all four. The outer part of the hoof is the usual seat of the disease; and from the cleft a sharp fetid humour exudes, sometimes engendering maggots, and corroding the flesh, and even the bone. Around the hoof there is an inflammation, which turns black, and the hoof sometimes drops off. It is a very painful disease, so that the animal frequently walks on its knees. When the weather gets cold it commonly gets better, but it still walks lame

As soon as the disease appears, examine the foot, and endeavour to open the diseased part, and let out the ichor. Wash it well, and dress it with mercurial ointment, and sulphur, or tar with red precipi-

tate; and bind it up with flannel, to keep it warm and clean. When it resists suppuration, and degenerates into a foul and tedious ulcer, spirit of turpentine, and even sulphuric acid are applied. In all cases the animal must be kept in clean, easy, dry pasture, till it recovers.

*Leg Evil.**—" This complaint arises most commonly amongst the South Down, or Leicester breed of sheep, but after is appears in a flock, the black-faced or Scotish sheep are equally subject to it. It it has almost never appeared to the north of the Tweed, although of late years it has been very common on the southern bank, in Selkirk, Roxburgh, and part of Peebles-shire. This may in part be owing to the long or white faced sheep being there principally kept.

" This disease generally begins at the knee, which generally swells to a considerable size, causing such a degree of lameness as to prevent the sheep affected from following the flock. Sometimes it begins at the head of the hoof. It is of a bluish or livid colour; sometimes, indeed frequently, having small blisters scattered over the leg affected, of a red colour, and filled with bluish coloured water. When the skin bursts, it leaves below it a loose flabby substance, of the same colour, or rather darker, which extends even to the bone. It generally first begins in one of the hind legs, but as it advances affects all the four, unless death takes place before this happens. It spreads occasionally from the hind legs to

* Black-leg, Mr. Beattie. Leg-ill, Mr. Scott.

the belly, and in every case the kidneys are affected, being loose and flabby, having some resemblance to the swelling of the legs, and being sometimes of a livid colour. Sometimes the disease proves very quickly fatal, and at other times will continue in a milder state for weeks. It spreads very rapidly after appearing in a flock, and if not attended to will injure them materially. It is in general very dangerous, cutting off the greater proportion of those affected. Indeed, many of the farmers kill the affected sheep whenever they observe them, to prevent its spreading. In this disease the eye of the sheep is languid, its tongue dry, it cannot eat, and in general is soon cut off.

It appears commonly in July and August, at times in September; arising at first from sheep of unhealthy constitutions being exposed to wetness during rainy and warm weather. Scratching in the legs will produce it in those whose constitutions are bad. If the sheep get their legs dirtied during clipping, or smearing in a house where there is much dung, they will readily be affected with it. Boggy ground has also a tendency to produce it, from the same cause.

As this is a very dangerous disease, the sheep affected should be brought home as soon as possible, to prevent it from infecting the flock; and its legs well washed with soap in water; afterwards bathed with lime-water, or a solution of alum in water; and then anointed with what in the shops is known by the name of *citrine* ointment, made with mercury dissolved in aqua fortis and mixed with

hog's lard. If this is not at hand, when the legs break out and run, a little quick lime may be dusted on the sloughs, and the leg dressed with a cloth, spread with fresh butter and a little tar. These should be changed every second day; care should be taken that the sheep have good and dry pasture during the time of the cure; and water, in which moss has been steeped, may be preferred (on account of its antiseptic quality) to common water, for their drink, and for washing the legs.

"After clipping, or smearing, in grounds subject to this disease, driving the flock through a pool or river, so as to wash their legs, is a very proper practice, and clipping the hair short upon them prevents any dirt from lodging on them.

"A disease somewhat similar to this, and affecting the tail, has been denominated

Tag.—It consists of scabs and sores, situated on the under side of the tail, arising in warm weather from its being fouled with purging. The matter hardens there, irritates the tender vessels, and produces sores which, if not attended to, run into mortification and prove fatal, as in the legs. It is observed by the sheep turning frequently round to bite the tail.

"As this complaint arises from purging, the first thing to be done is the cure of this. (See purging.) Then the tail is to be clipped, and the sore part laid bare, washed carefully with milk and water, blood-warm, and then with lime-water. Turn out the sheep into a dry pasture, and look at it again in two days, and if not well, repeat the washing, and anoint it with grease and tar mixed together, in equal pro-

portions. Doing this twice, is generally sufficient for completing the cure." Mr. Stevenson.

Vermin.—The ked *(hippobosca ovina)* molests all sorts and ages, but particularly hogs or young sheep, and chiefly such as are lean. It harbours in the wool, bites the sheep and sucks their blood. Smearing with tar expels it from the skin, and it soon afterwards drops from the wool. Tobacco juice is fatal to the ked almost instantaneously, and mercurial ointment destroys it.

The tick *(acarus reduvius)* is a distinct species of vermin, harrassing the lambs and trembling sheep in spring. It always adheres close to the bare spots of the shoulders, thighs, or ears, draining the blood. For the most part it drops off in June. It is removed by the same remedies as the ked, but it is prevented by having the young sheep in good condition.

For the fly, the sheep powder, or unslacked lime, is the best cure.

Maggots are troublesome in August, when the season is warm. They are the brood of the flesh or sheep-fly *(æstrus ovis)* which deposits her eggs in any filth adhering to the skin, or any wound or sore. There the eggs are soon hatched, and the maggots eating and penetrating in every direction under the skin, cause intolerable pain, and even kill the animal, if not removed. When sheep, therefore, are observed to be uneasy and harrassed, to frequent rubbing places, neglecting their food, to lie down frequently, and to bite themselves with their teeth; they should be examined carefully: when large

blisters will be found, under which the maggots are concealed; or the part is of a dark colour, and quite wet, or large holes are already eaten into the body of the animal. The wool must be carefully clipped off, the blisters, if any, opened, and the vermin picked from the infected parts, which are to be gently washed with soap and water, or spirits and vinegar, or lime-water, or stale urine and black soap, or infusion of tobacco, and anointed with tar, or tar mixed with butter, or sulphur, or red precipitate. After this the animal soon recovers. As a preventive, whenever the animal is wounded by the sheers in clipping, by the bite of a dog, or any other accident, a little tar liniment should be applied. Dirty layers are apt to produce this kind of vermin, which most commonly attacks lambs, and frequently appears about the hips of those which are affected with looseness. This, however, is not always the case, and Mr. James Hog says, that it is easy to discover, while they are still clean, those that will become infected, from the noxious smell of the excrement, occasioned, in his opinion, by some kind of food, or a certain habit of body.

*Jaundice or Head Ill, or Yellows.**—Jaundice is not a common disease among sheep, and has not been very accurately described, so that it is highly probable that several affections are confounded under the various appellations given to it. I shall therefore, not attempt to reconcile their accounts of

* Jaundice, Mr. Stevenson. Yellows or Jaundice, Mr. Singers. Yellowses, or Jaundice, Mr. Scott. Yellow Sickness, or Jaundice, Mr. J. Hog. Yellowses, or Headswell, Mr. Beattie. Head-ill, Mr. W. Hog.

it, but quote separately the descriptions of each author by whom it is mentioned.

"This is not a common disease, and is generally confined to the South Down and Leicester breed, which, from their more tender constitutions, are more subject to complaints.

"The symptoms are, a yellowness over the body, which is particularly observable in the white of the eye. The wool has a little also of the tinge, and is slightly hard. The passages of the belly are of a whitish colour, and the urine tinges of a yellow hue any thing immersed in it. Sometimes there is a degree of fulness and hardness in the right side, where the liver lies.

"The causes are by no means apparent; their effect, however, seems generally to harden the liver, and invariably to obstruct the passage of the bile from it into the intestines. Sometimes small stones, formed in the gall-bladder, produce this; and at other times, as in rot, by the swelling of the glands, impeding the passage of the bile, jaundice is produced, in which case it is generally incurable.

The cure of jaundice is to be attempted by strong purgatives, and such medicines as act strongly on the stomach. A solution of three ounces of glauber's salts will partly tend to produce this. Ten grains of ipecacuanha, given every three hours, in a little warmed strong beer, is said to be attended with the most beneficial effects, when continued for five or six days, and a dose of glauber's salts given after it, so as to clear the bowels. I never had an opportunity of seeing jaundice but once; in which case the

disease had gone on for some time, without being observed, or even suspected, till the yellowness of the fat and flesh was observed after slaughter, which effectually prevented its sale: thus proving a loss to the butcher, who never observed it." Mr. Stevenson.

"There is another rare distemper, called the yellow sickness, which I do not at all consider as a species of the braxy, but rather a sort of jaundice. They pine in it for some days, and are very sick. The entrails, on dissection, are of a dark yellow, and have likewise a smell peculiar to that distemper, flavouring something of sulphur. But this is a disease peculiar to old sheep, and, had it not been for the name, ought not to have been mentioned under this head (viz. *Sickness*.) Such sheep as feed on woody banks are most subject to it; and I always consider it as proceeding from their eating some poisonous herbs. There is always a sort of congealed stuff, like rotten eggs, about the kidneys." Mr. J. Hog.

"Old sheep are sometimes affected with the yellows, or jaundice, at different seasons, but chiefly in harvest, and in mossy pastures. The whole body puts on a yellow hue, and even the tallow is of the same colour, when the body is opened after death. The distemper, from the period of its giving the yellow hue, is soon at a crisis, being fatal commonly in twenty-four hours, or within that period. It is not a common disease.

"Obstruction of the bile appears to be the immediate cause of the yellows. When that liquid

ceases to pass into the intestinal canal, the digestion of aliments and separation of chyle do not go properly on. The bile also takes a new course, and contaminates the animal system.

"What it is that causes these obstructions we do not certainly know. The putrid mismata of stinking water, or the water itself taken into the stomach, are suspected; so likewise are poisonous insects or plants. The liver, being the organ that secretes the bile, whatever disorders that organ may affect this fluid in its nature, quantity or course; an incipient rot, that injures the liver, may therefore be capable of taking a new turn, obstructing bile and bringing on the yellows. It is possible, also, that sand, or calculi, may produce this effect.

"The most promising means of cure, are solutions of salt in water, which tend to promote the regular secretions. Some recommend sulphur in warm milk, or saltpetre in common water, bleeding in the tail at the same time, and causing the sheep to move and keep itself warm. If these things do not appear to give relief, it is then recommended to kill the animal, and to draw off the blood. The carcase is said to be less injured than in sickness. Yet I should doubt the propriety of allowing it to be eaten, if highly tainted with bile; for I know the gall of a sheep, swallowed entire, proved a mortal poison to one of those large and powerful greyhounds that were once carefully reared in the Highlands for hunting down the hart and hind.

"As the jaundice appears chiefly in mossy pastures, and towards latter harvest, we have another evi-

dence of the impropriety of confining stocks to that wet soil so late in the year. If poisonous animals are concerned in bringing it on, I know no remedy so efficacious against them as burning the rough herbage at the proper season. Moss holes are not easily rendered putrid; they differ extremely in this respect, from holes in clay, which exhale noxious vapours in immence quantities. Yet the waters of moss may become corrupted; and being otherwise dangerous, they should be drained off. Sheep may be safely, and to great advantage, pastured in drained moss, free of these holes, in spring; but being then weak, they might readily fall in, and be lost in holes.

"I have often suspected the bite of adders as the cause of jaundice in sheep. In this case vinegar should be applied, and put down its throat. I knew this relieve a man is that state, by his throwing up directly an immense quantity of bile." Mr. Singers.

Mr. W. Scott briefly notices, that it is not common, but dangerous, that the whole body is swelled, and that good effects arise from cutting off the ears entirely, and the tail by the middle.

Mr. Beattie mentions, that there is a great swelling and falling down of the ears, and that when too long neglected the head swells, and the sheep dies. The flesh is yellow. It is often cured by cutting off the ears, cropping the tail, or opening the veins under the eyes in time.

"The *head-ill* is the next disease we shall take notice of. I cannot apprehend that this disorder is radically in the nature of either sheep or soils. I

rather think it is an adventitious evil, caused by the bite, sting, or influence of some venomous animals: for proof of this, I may observe, that this disease is most frequent in those parts, where such reptiles are known to abound. The sheep, unapprehensive of danger, comes nearer the lurking-place of the fierce animal* than it wishes it to do; the enraged creature flies at it in a moment, and by biting, stinging, &c. communicates its malignant nature: instantaneously the head swells, the tongue and gullet inflame, and turn black; the extraordinary swelling soon obstructs respiration. Perhaps in this condition it lives a day or two, then dies: doubtless in great agony."

"Of the same nature, and from the same cause, proceed the inflammation in the belly, udder, &c. that is so frequent in the summer months. The best thing that can be done for sheep in these circumstances is rubbing and soaking the infected part with Norway tar."

Dropsy.—Dropsy in sheep is rather a symptom of other diseases than a disease itself. In different degrees and forms it is incident in all the varieties of soil and climate, from Shetland where it is called the shell sickness, or water sickness, to the south of England. In general, aged sheep are most subject to its attacks, chiefly towards the end of harvest and winter, and on farms destitute of shelter. Indeed it is the genuine offspring of cold and moisture. Its

* Among the venomous creatures that hurt sheep in this place, we generally reckon the adder, snake, slow-worm, and a large kind of asps, that haunt woods, and warm parts.

symptoms are swelling in the legs at night, which disappears in the morning, when the lower jaw is a good deal swelled. The eye is dull, urine, when observed, is high coloured, the tongue is dry, and when the disease advances the belly becomes tense, and water is felt undulating in it, on being struck with the one hand, and the other is kept steady in the other side. The sheep loses heart and appetite, becomes lean, and at last falls.

A dry sheltered walk is a good preventive, and sea shores are found by experience, to be useful in this distemper. But if it should appear with severity in very wet seasons, in winter or spring, night shelter is of particular importance to stop the increasing evil.

A shade, or house-room, and an allowance of dry hay, should be given to those which are diseased. Mr. Stevenson has seen tapping tried, but the relief was very temporary. In one case two drachms of cream of tartar given twice a day, in a little warm water, had a remarkably good effect. But upon the whole he considers it the best plan to kill the animal as soon as the disease appears, as it never affects sheep in health, but reduces them daily.

Blindness.—Certain parcels of sheep are very subject to blindness, and although it is not a fatal disease in itself, it frequently occasions considerable loss by their drowning themselves, or breaking their necks. It is occasioned by a white film growing over their eyes, in consequence of inflammation, probably of different kinds, at least arising from different causes.

According to Mr. Stevenson, "the symptoms that first appear are: the animal cannot bear the light, and the white part of the eye is red and inflamed, and it waters a great deal. This is succeeded by a membrane formed by the inflamed vessels, which first covers the white, but gradually extends over the eye, till total blindness ensues. This is observed to have taken place, when in folding, they run against dykes, or any other obstacle, and start when they approach it; they do not follow the flock, and frequently stumble. When the eye is inspected, it is generally found, that a blue slough covers the whole of the eye, without any intermixture of red vessels. In the worst cases the coloured and transparent part of the eye becomes of a reddish white, by which time the film on the eye has acquired considerable thickness."

The inflammation is produced by various causes. In summer it is ascribed by Mr. Stevenson to the reflection of heat and light in very sunny and dry weather, as it is more frequent when the hills become scorched, and on hard rocky soils, than on dark coloured hills covered with heather. The Rev. Mr. Singers thinks that it is sometimes caused by the pollen of flowers irritating their eyes, when blown into them in considerable quantities. In winter, blindness occurs, when the days are very sunny, and the evenings frosty and cold, or when sheep have been long buried under snow, and the ground is still white when they get out.

Mr. James Hog ascribes the blindness of sheep to a cause totally different from any of these. It is

therefore proper to quote his description entire. "It is occasioned by a continued fatigue for a length of time, which will bring it on at any season of the year. Thus sheep that are long and hard driven, or such as are daily dragged from one part of the ground to another; ewes that are eild, and roughly used by the women during the time they are milked, and hogs which are fatigued by driving through snow, to preserve their subsistence, are all subject to it. Their eyes at first become sore, and emit a sort of ropy humour; after which a white film settles over them, and if they continue to be fatigued it grows thicker, and the eye appears perfectly white; in which case they are proportionably longer of mending. For this some bleed them below the eyes, and let some of the blood run into each of them; but the enjoyment of ease will infallibly cure them in a space of time, proportioned to the fatigue which they underwent before."

Where blindness is like to be produced by the pollen of flowers, the sheep must be removed to some other pasture, where they are less abundant, till all the antheræ have exploded; and in cases of snow-blindness it is proper immediately to bring them down from the snowy walks to bare grounds.

Besides the remedies mentioned in the quotation from Mr. J. Hog, Mr. Stevenson advises the inflamed vessels on the white of the eye, especially those next the nose, to be cut with a sharp penknife every second morning, while the eyes are to be defended against the light by a shade tied over the head, or a piece of crape over the eyes. The eyes may be also

bathed twice a day with a solution of half a drachm of sugar of lead, or of two drachms of alum, and two of white vitriol, in a mutchkin (*English pint*) of water. Internally, purgatives may be given, such as two ounces of glauber's or common salt, or ten grains of sweet mercury, once a day, for four or five days. When these remedies have got the better of the inflammation, but the slough still remains, a little ointment, composed of eight parts of basilicon and one of red precipitate of mercury, inserted every morning, or a little powdered crystal and loaf sugar blown into them twice a day.

Rolling awald.—Sheep are most apt to die awald when it grows warm after a shower, from the beginning of May, till they are shorn. They lie down, roll on their backs, to relieve the itching there; and if the ground happens to be level or hollow, or if they be weak, heavy with lamb, fat, or full fleeced, they are often unable to get up, and soon sicken, swell, and die. The flesh of sheep which die awald resembles in taste, colour and smell, that of sheep carried off by sickness. When a sheep is observed in this situation, the shepherds should lift it up, and the afternoon is the best time for him to make his rounds, and see that all is right.

Drowning.—"Sheep sometimes drown in soft mossy land, and at other times in places where people have cut their peat fuel. In former times the cutting of these peats was often carried on in a very improper way. On a surface of not more than three or four feet square, three deep, peat used to be cut, making a pit more than four feet deep. These pits were filled up with water. In dry weather sheep

come and drink of this water, which gradually diminishing by a continuance of drought, occasioned their stretching farther into the pit for it, and the consequence was, that they often stuck and were drowned. I have a concern myself in a farm, where upon my entrance to it, many such pits were found. I saw it necessary to make outlets for the water, where it could be done, and break down the turf upon each side, so as to fill up the pits, and remove the possibility of any stagnating moisture in time coming. The sheep can now pasture upon every part of the farm with all freedom. When peat cutting is performed with care, so as to prevent all danger to sheep, and all waste of pasture, openings are made for the water; only one foot deep is taken; the surface turfs are carefully laid aside, and after the peats are taken out these turfs are brought back one by one, and placed upon the part that was made bare. This operation is called 'shoeing the moss,' and the grass is scarcely ever stopt from growing." Mr. Welsh.

Accidents in Smearing.—"It is dangerous to lay on too much tar. There is also a species of tar that proves acrid, blisters the sheep, causes the wool to fall off, and sometimes proves fatal to them. This tar is more dangerous for tups than for other sheep; probably because the tar runs quicker on the skin of a tup, and his temperament is warmer. I have been informed of several tups dying in one night after being smeared, without the loss of any other sheep, although the tups were laid fully as light. I know also, that laying on much tar, or mingling it

in great proportion, has been hurtful to some sheep, and fatal to others; when the same tar, laid on lighter, and with more butter, did no sensible injury to other stocks. When the tar is thin, and appears black on stirring it, and when the smell is offensive, and the taste caustic or acrid, it should never be used for sheep, unless there be an absolute necessity, when it ought to be boiled a little, before mingling, to dissipate the caustic parts. The component parts of tar, which is obtained by fire from the fir, are, by Dr. Thompson's account of it, oil, resin, water, and pyrolignous acid. It can only be this last ingredient that can prove caustic and hurtful to sheep: the pyrolignous acid consists of acetic acid, and empyrematic oil, so called, as being formed by fire; and all this class of oils are of an acrid taste. The pernicious ingredient, together with the watery part, may be dissipated so far by fire, in boiling the tar. The smearers often find proof of the danger of this acrid tar by its burning effects on their fingers; and, as a general rule, it should be rejected.

"Good smearing tar, on being stirred, appears thick, brown, and ropy; and has also a more pleasant smell, and less acrid taste, than the other." Mr. Singers.

Accidents in Shearing the Sheep.—"There is sometimes a degree of danger in the slightest mark of the wool scissars, for which the shepherd is at a loss to account, the part very quickly running to inflammation, followed by mortification and death. At other times these marks heal up more kindly. It will be sufficient to mention the known causes of

this danger. The sultry state of the air is suspected; flies are dangerous, by infesting the wounds, and causing them to spoil; on which account the clipping should be at some distance from houses or dunghills, and even from cow dung in the fields.—Care should also be taken to allow them clean airy pasture after the operation is over. And in performing this operation, the ointment used for any accidental mark should rather be a mixture of beeswax, than of tar in the butter; or if tar be employed, it should be good of its kind, and well boiled, to make it firm in the wound." Mr. Singers.

Accidents from drifting Snow.—"These are most fatal when the frost is keen, the wind violent and the snow light and mobile. The defenceless flocks move before the blast, into some hollow place, where they find some relief from the piercing storm. There, in a short time, they are covered up deep with snow drift; and if long confined under it many of them die, the survivors being much reduced, and sometimes having lost part of their wool. Should this retreat be a rivulet course, as often happens, and a sudden thaw come on, the melted snow brings down a torrent of water on them, and they all perish. Smooth, green hills, destitute of rocks, woods, or other shelter, are most in danger from snow drift. Of this description are most of the sheep farms in the parish of Eskdale-muir; and on the fatal storm on the 24th of January, 1794, above four thousand sheep and some heifers were lost in that single parish. I have been told that Mr. Robert Hope, at Newtown, in Crowford-muir, sold 50*l.* worth of skins that year, at 8*d.*

each. Many store-masters lost ten, twenty, thirty, or forty score of sheep; and many shepherds also lost their lives in quest of their flocks. An amazing fall in the barometer gave warning of that particular storm. Tradition records, that the year 1674 was fatal to most of the sheep in the head of Eskdale, by snow drift, in the end of February and beginning of March. A long course of frost and snow was destructive in 1740: the year 1745 was of a similar description: the seasons were successively calamitous from 1751 to 1755: one third part of the stock were lost by frost and snow in 1772. Then, after some favourable intervening seasons, followed the fatal storm in 1794. These facts have been accurately collected and recorded by the minister of Eskdale-muir, among many others of importance to his parish, partly in manuscript, and partly in his statistical account thereof; and his accuracy and integrity are well known.

"To preserve the sheep during snow drift, they must be collected in the best manner, and safest way that can be done, and kept moving, to prevent two evils; one is, their being benumbed with cold, and the other is, their being overblown with drift. Many sheep have perished benumbed with the piercing storm, and have been found on their backs, with their feet straight upwards. Stone bields are of use, no doubt; but the true and effectual shelters are plantations of forest trees, to which the sheep make, of their own accord, when warned by nature of the approaching storm." Mr. Singers.

Accidents from falling wreaths of Snow.—"When

the blasts of winter have accumulated vast masses of driving snow, in a spiral form, near the top of some rising ground, or projecting rock, and the sheep have taken their station farther down, where they find a temporary shelter, the weight of the mass increasing above them, it is at last precipitated down on the sheep, and they are miserably crushed, buried up, and lost. Such a shelter is always beheld by the attentive shepherd with a jealous eye. But in large farms, destitute of all shelter, natural and artificial, how can he relieve them? They cannot continue, without food, to walk incessantly among the snow; and if they lie down to rest themselves without shelter, the cold is so intense as to freeze them to death; or if the shelter they find is of the dangerous kinds mentioned, they are drifted up out of sight, or crushed with falling masses of snow.

"Thirteen sheep belonging to Mr. Gibson, at Polmood, Moffat Water, were overwhelmed at once, and hurried down to a great distance, and most of them killed. This instance is only one out of many. The mass of snow that carried these down, was of such dimensions as to have covered as many scores, if they had happened to be there, in its way." Mr. Singers.

Accidents from mock Thaws.—"When a partial thaw comes on after a fall of snow, and is followed by hard frost, the sheep are all at once deprived entirely of their food. They could have dug into the snow while it was soft, and found subsistence at the bottom of it; but this cannot be done when half thawed, and afterward crusted over by a frozen

plate. If such a state of things continue above a day or two, the sheep must be supported in another manner, otherwise they fall greatly away, and become very unfit to contend with the severities of the remaining parts of winter and spring. To retreat into a lower district, where they may find pasture, is not always practicable. Of what importance therefore, does a stack of good hay appear when the stock is in such a situation. A stone of good hay supports a score of sheep for a day, computing 24 lbs. averdupoise to the stone; and they lose very little of their vigour or flesh.

"Proprietors may consider the importance of such a provision; and if they desire to see the stack of hay, it is necessary to give encouragement to rear it, and to furnish a stimulus by their countenance and attention.

"I have known farmers paying snow mail, at the rate of 10*l.* per day; and their sheep after all poorly subsisted." Mr. Singers.

Accidents by Birds and Beasts of Prey.—"The wolf has been destroyed out of Scotland, in which it certainly once haunted: but the destruction of the fox must be conducted with more zeal and keenness, before this artful and formidable enemy of the sheep can be banished like his elder brother the wolf. The wild cat, *ferus*, possesses extraordinary fierceness and strength, and is destructive to the lambs and poultry from its haunts in the woods. The foumart, a species of the *mustela*, is also cruelly mischievous among weak lambs, unprotected. Eagles chiefly frequent the northern districts, and their

strength and depredations are well known; but the ravens are probably more destructive, being ready to attack the sheep in all cases of distress, and exceedingly quick-sighted in discovering these.

"It is the real interest of proprietors and farmers in every quarter, to give premiums, to such as will accept them, for the claws and skins of these birds and beasts; to support and assist fox-hunters; and to persevere, without intermission in their efforts, so long as an individual of these carnivorous animals is known to frequent their lands. Excellent regulations have been introduced on this subject, in particular districts and estates; but very commonly the alacrity subsides, and people relapse into indifference. Of course, these noxious animals multiply, and renew their depredations. I have heard of farms so infested by them as not to command their real value in rent, by one third part, in consequence of the mischiefs apprehended." Mr. Singers.

Rot or Poke.—The effect of the modern improvements in sheep farming, in lessening the frequency of this insidious and destructive disease, has been so great, that I feel myself almost warranted in adopting the figurative exordium of Mr. James Hog. "I shall now endeavour to describe that other ravager, the rot, whose appearance, haunts and lineage, I shall so minutely scrutinize, that he shall without fail be apprehended and banished the country, or forced to fly into a voluntary exile."

As sheep, however slightly tainted with the rot, never recover perfectly, and as in the early stages of this disease, they fatten as quickly as healthy sheep,

it is of great importance to the store-master to be able to distinguish them as soon as they are affected, especially when drawing his stock about Martinmas. The following rules are given by Mr. Beattie:

"The first thing to be observed is in the spring, when they are dropping their lambs. A sound ewe, in good order, drops a lamb, covered with a thick and yellow slime, which the ewe, licks off it, and the rule is, the sounder and the higher condition the ewe is in, the darker and thicker will be the slime; but when they observe an ewe drop a lamb covered with thin watery bubbles, and very white, they note her down as unsound."

"About the month of September, when they intend to dispose of their draught ewes, they put all their sheep into a fold, and draw them by the hand, that is, they catch them all, viz. the ewes they design to sell any of, and clapping their hand upon the small of the back, they rub the flesh backwards and forwards, betwixt their fingers and thumb, and the ends of the short ribs; if the flesh is solid and firm, they consider her as sound; if they find it soft and flabby, and if, when they rub it against the short ribs, it ripples, as we term it, that is, a sort of crackling is perceived, as if there was water or blubber in it, they are certain she is unsound. This is the most certain of all symptoms, but is not to be discerned, with any degree of certainty, but by an experienced hand; for although, as I have here related it, it seems a very simple affair, and easily acquired, yet it is well known, that many shepherds

who have followed sheep all their lives, never arrive at any thing like certainty, in judging by the hand, whilst men of superior skill will seldom be mistaken, and will draw by no other rule. Yet still it must be acknowledged, that the seeds of this disease will sometimes lie so occult, as to baffle all skill, and that no man can, with absolute certainty, draw a stock tainted with the rot. There is another method to which men of inferior skill resort, which is more easily acquired. They take the sheep's head between their hands, and press down the eyelid, they thereby make the sheep turn its eyeball, so that they get a view of the vessels in which the eyeball rolls; if these are thin, red, and free of matter, they consider the sheep as sound, but if they are thick, of a dead white colour, and seem as if there was some white matter in them, they are confident she is rotten: this is a pretty general rule, and easily discerned; but I think, it is not so certain as when they are judged by the back; for in firm, healthy lands, the eye of a sheep is far redder, than it is in sheep upon grassy lands. And in some boggy lands, the eye is never very red, be the sheep ever so sound: so that there you cannot so well judge by the eye; but when you see the eye of a sheep a good deal whiter and thicker, and more matter in it (I mean the vessels in which the eyeball rolls,) than the run of the flock amongst which it feeds, you have reason to suspect it is not sound.

"There is another method by which I have seen some men attempt to judge of the soundness of sheep. It is a well known fact, that when sheep are

rotten, the lungs swell to a greater size; they, therefore, lay the sheep down upon its broad side, and pressing the skin in at the flank, up below the ribs, pretend to feel the lungs. But if there is any thing to be learned by this, I could never perceive it, and have seen some men, who pretended to know most by it, very often mistaken.

"These are the principal rules by which the Highland farmers draw their stocks; and they relate all to ewe stocks; for as to wedders they are generally all sold off when they are three years old; and those that buy them for feeding, mostly buy them by the condition they appear outwardly to be in at the time, and the character of the ground upon which they were bred."

In addition to these marks, Mr. Scott thinks the distribution of the fat in the different parts of the body affords good grounds for judging of the soundness or unsoundness of sheep. If the back be poor, there is danger; but if at the same time, the breast and belly be fat, the danger is much greater; while, on the contrary, if the under parts be lean, while the back is tolerably fat, the animal is sound.

The appearance of the mouth, and state of the teeth must also be examined. If the tongue be red and clean, it is a good sign, but if the gums look pale, and the teeth are wide and narrow at the top, she should be kept no longer, as she is unable to eat the fine ley grass, which grows upon what is called bittle ground, but is obliged to take the tath, and is apt to be infected. "The age of a sheep," says Mr. J. Hog, "is easily known from its teeth. In

its second year it has two broad teeth in the middle; it its third year, four; and when rising its fourth year, six broad teeth. Next year its teeth are all cast, and consequently all those called broad teeth; and when it is five years old, and rising six, they grow as narrow at the top as at the root, whereas before, each tooth spreads at the top. If the sheep is not a very good one, it should be put off this year, especially if on a soft ground, and of the cheviot breed. An ewe on a hardy ground will hold out a year longer, and the next year, when outgone six, the teeth are narrower at the top than at the root, and then they should be kept no longer; for as they open at the top, the grass on pulling gets between them, which incommodes them so much that they cannot thrive. When they grow old, their fore teeth also appear each with a point below, the gums having fallen down from the middle of them, where there appears some yellowish stuff, resembling putty."

If an unsound ewe be left among the flock at Martinmas, she may live, if the winter be uncommonly mild and good, but will never turn to any account; but if the winter should prove severe, or if she experience any want of food, she acquires a languid, sleepy look, the eyes become heavy and inanimate, she is listless and inactive, and her voice becomes feeble. On removing the flock from one place to another, she always falls in the rear, and will not give herself the trouble of searching for sound food, but inclines to go by herself, and always eats in the heads of springs or marshy places, where a

kind of tender grass rises early in the season. Even at night when sound sheep go to the tops of the hills, she loiters behind, and lies about the burnsides and flats at the bottom. When obliged to run or ascend a hill, she wheezes and coughs, and seems quite exhausted. At last she will not go up a hill at all, but if you attempt to dog her up she directly turns and runs down; and if you attempt to drive her without a dog, however gently, she will lie down before she reaches the top. Even in this stage an ordinary observer will not discover that she is at all ill, when she is allowed to stand or go at ease; for in general she appears bulky, and does not seem to have lost much flesh.

Her shape now begins to change, the belly being shrunk and drawn upwards for some time, and so long as this is the case she eats voraciously; but as the disease advances, the belly falls down, and the flanks sink in. The wool, although, according to Mr. Scott, its pile becomes finer, assumes a dry, withered appearance, seems thin and ill coloured, and it continues erect, but it is loosely attached, and comes easily away in handfuls. Her neck seems to lengthen and she is unable to raise her head. A bag or swelling, filled with bloody serum, often appears beneath its skin, in mild, damp or rainy weather, decreasing for a time, when it becomes frosty or dry. The tops of her ears hang down on a level with the roots; she slavers much, and the eyes are large and heavy, with a white spot above the star. A kind of scab sometimes appears over the body, said to be infectious. She becomes quite lean, her debil-

ity increases, the swelling beneath the chin sometimes reaches an incredible size, very great thirst takes place, and the purging of a blackish matter is the harbinger of death.

Appearances on Dissection.—If opened soon after it is dead, a sheep which dies of the rot emits very little smell. Upon taking off the skin, which is unusually tender, the fell, as it is called, is entirely white, and the whole carcase has a dull white, or leaden colour. In the belly water is sometimes found. The liver, and especially its concave side, is always enlarged, sometimes to a very extraordinary size, and instead of its healthy red colour, is of a livid dun, variegated with many white spots. These correspond with indurated portions of its substance, which are the more easily felt, as the other parts are soft and spongy; or it appears as if interlarded with layers of sand. Both upon the outside of the liver, and in its ducts, are generally found great numbers of an ugly flat insect, having some resemblance in their shape to flounders or flukes (*fasciolæ hepaticæ.*) These are not, however, peculiar to this disease, as they are found, though very few, and very small, in most aged sheep, and as in some rotten sheep they do not exist. When the liver is very rotten, it is also studded with hydatids or globules of water, which are likewise found adhering to the lungs, and among the tallow. Besides, the liver does not stiffen when boiled, and is said by Mr. W. Hog to become very quickly putrid. The small intestines are blackish and tender, as if they were rotten, and will scarcely bear handling, and the

lacteal glands, or clyars as they are called, are always swelled and hard.

The lungs are likewise swelled to a great size, and assume a whiter colour, and are often streaked on the outside with white, and under these streaks are to be found hard substances, like cartilage, or even bones.

Mr. Stevenson is more particular in his description. "In the rot the lungs are the principal seat of the affection, and on opening the body they are found sometimes almost destroyed. In the whole of their cellular substance there are a number of white round knobs, of a larger or lesser size, which in the parts most affected are found swelled into a bag, which is filled with white and pure matter.—Some of them are very large, and the side of the lungs in which they exist is quite destroyed, and a membranous bag left in their place, full of matter of a thinish appearance, which is at times coughed up. Hence arises the difficulty of breathing.

"When these swelled parts, or tubercles as they have been called, are in the lungs, the latter generally adheres to the side of the ribs, which they do not do in a natural state. These tubercles I have seen in lambs, scattered through the substance of the lungs like so many pin heads. In general the left side of the lungs, or that in which the heart lies, is most affected in rot. The lungs are found at times considerably swelled, and a collection of water around them. This is only, however, towards the beginning of the disease."

The mutton of rotten sheep does not stiffen when

cold, but remains flaccid, and when boiled dissolves away to mere membrane, and has a weak, watery, and insipid taste; the muscular fibres are pale and wasted, but the fat seemingly remains. It, however, appears dry, dead white, and brittle, or shining with water, and in its nature it is completely altered, for it does not melt or inflame like an unctious substance, but when thrown on the fire crackles, and blackens to a cinder. Very little blood is found in the animal, and it is pale and thin, resembling water tinged with blood rather than blood. The bones are remarkably brittle.

Causes.—Where the pasture is soft and tathy, without a due proportion of heath, ling, &c. the rot is always the consequence; and after a severe and frosty winter, when sheep have suffered much from hunger, cold, &c. the rot sets in upon soils of almost every description; but in proportion as the soil is soft and rotten of itself, so is the number of rotten sheep.—Hence some people have been led to consider the rot as of two kinds, viz. the *querney* or *black rot*, proceeding from foul feeding, and the *hunger rot*, from an absolute deficiency of food of every kind. The only circumstances, however, in which any distinction between them is pointed out, are, that in the querney rot the animal is often apparently fat when it dies; while in the hunger rot it is always completely emaciated; and that those which rot from the softness of their pasture are irrecoverably lost, while those which rot from hunger, or bad usuage, more frequently seem to recover, and become apparently tolerable, though never good sheep. They

are, however, not to be depended upon, and gradually drop off, season after season. Mr. Scott says, that in the hunger rot, there is no poke, while on the contrary, Mr. J. Hog states, that a very lean, rotten sheep is most apt to have the poke.

Others speak of many different kinds of rot, and distinguish them by different names, as the *cot* or *heart-rot*, the *fell-rot*, the *bone-rot*, and other rots; but Mr. Beattie and other intelligent farmers are of opinion, that all the different appearances in the body of the animal, are but different symptoms of the same disease, and are all derived from the same cause.

For the sake of perspicuity, however, the causes which contribute to the production or prevalence of the rot may be considered as depending on the soil, on the weather, and on the animal itself.

In the course of this treatise many facts have been recorded, which prove the very great influence of the soil on the constitution and health of the animals which pasture upon it: in no instance, however, is this influence more conspicuous than in the production of the rot. It is well known, that the constitution is so dependent on the soil, that in different hirsels, it varies as much as the food on which they pasture. Sheep bred where heath, bent, ling, deer-hair, thyme, &c. abound, though generally smaller, are not only infinitely superior in point of the flavour of their mutton, but far exceed in strength of constitution those bred in moist, wet, boggy land. On the latter of these pastures rot is endemial, on the former individuals are carried off by sickness; and it is

remarked, that in farms subject to the one of these diseases, the other is almost unknown. On this subject Mr. James Hog has fortunately enabled me to quote a letter written to him by Mr. Bryden of Aberlosk, whose improvements in sheep farming, form a kind of epoch in the history of the rural economy of this country.

"Concerning the rot, of which you are so anxious to learn every particular, and why it is peculiar to our soft grassy lands, I have jumbled together the few suggestions which follow, for your consideration.

"It is a general observation, that wherever there is a rapid growth, the decay is proportionally so, and in all places where growth is slow, decay is slow also: and all vegetable productions that have a slow gradual growth, and permanent duration, are productive of similar effects on the animals that feed upon them; while, on the contrary, such animals as feed on herbs and grasses that have a rapid advance and sudden decay, are so much influenced by it, that their bodies partake much of the nature of their aliment. Of the truth of this observation, a survey of the various animals of our own country, will fully convince you; and when you consider the following theory, this will account for the circumstance of the rot being peculiar to soft grassy lands, and also, in part, for the prevalence of that nervous disorder, called the trembling, or thwarter-ill, among sheep which pasture on heath, broom, and other herbage of astringent qualities and permanent duration; and it is a fact, that changing sheep from one of these

walks to the other will prevent the disease peculiar to each.

"For as to the rot, I maintain, that it is always occasioned by a too quick transition from fatness to leanness; and though this opinion may be supposed new, it is nevertheless correct. There never were any sheep known to rot, while they continued at good, equal maintenance, unless otherwise abused; and none ever will rot, kept on pasture which does not feed them very fat, or allow them to fall away below a medium."

The quality of the food in the autumnal quarter, has a more immediate influence in tendering their constitution, than at any other period. It is then they should acquire that strength and hardiness with which they have to struggle with the rigour of the ensuing winter, the trying blasts of backward spring, and the still more searching duties of a nurse: consequently, if they be allowed, or compelled to fatten themselves up with soft unsubstantial nourishment, which loosens the bowels at this improper season, and relaxes the whole system, nothing is to be expected, but a great waste of body through the winter, and a tainted constitution in the spring.

Although some sorts of grass are certainly more dangerous than others, and some are even considered as having a tendency to prevent or cure the rot, yet the very same plants, which in certain circumstances rot sheep, by a different management are perfectly innocent. All grasses which are remarkably rank and luxuriant, are called *tath*, by the stock farmers, who distinguish two kinds of it; *wa-*

ter-tath, proceeding from excess of moisture, and *nolt-tath*, the produce of dung. The latter is darker coloured than the former, but their softness, luxuriancy, and tendency to induce the rot, are nearly the same. Water tath is the produce either of lands naturally too moist, of wet seasons, or of accidental or artificial flooding. Nothing is so apt to induce the rot, as the grass which grows in low marshy grounds, awald lands, and around the heads of springs, especially on the north side of hills, so much so, indeed, that such pastures were formerly considered as naturally rotten, and rejected and shunned by all intelligent sheep farmers.

Rot also prevails most in wet seasons, especially if the weather prove soft and mild, about the latter end of autumn. The long fleeces of the sheep are not only drenched with rain, if they be not provided with sufficient shelter, but a very soft and tender tath rushes up, the influence of the sun is small, and sharp frosts commonly succeed, which waste with rapidity the newly acquired substance. Besides, bog ground is, for the most part, covered with sprit, of the smaller sort of which they make what they call *hog hay*, for young black cattle; and of the coarser sort, thatch for covering their houses. In wet seasons this shoots up to a great length, and is apt to lie down in July, and to rot afterwards. When this is the case, about September, there arises amongst it a light coloured, soft, watery aftergrowth, which continues growing, until it is withered by the frost, and which is one of the most pernicious foods.

Accidental inundation, as well as artificial flooding, operate, not only by soaking the ground with moisture, but also by the sand, mud, slime, or ooze deposited among the roots of the grass, and which when sufficiently watered, act like manure, and greatly promote the growth of tath. Flooding, however, is not equally dangerous at all times. If a rivulet should overflow its banks about Whitsunday, no bad consequences will follow, unless the succeeding season prove wet. But the verdure, however early, which rises on the banks of rivulets that have been inundated in the spring or winter, is sure, according to Mr. W. Hog, of rotting the sheep which habituate themselves to it. Mr. Singers, however, tells us, that the danger is greatest in harvest, lessens in winter after frosts have set in, and is least of all in spring. The character of some sheep farms was almost blasted by some pieces of low grounds which rotted the sheep in harvest, from being liable to be summer flooded. Mr. Keir, at Milnholm, near Langholm, suffered from pasturing sheep on lands which were flooded after the removal of the hay in a dry season, when the soil seemed to need it, although the water was allowed to flow only for a few hours. Mr. Robson, Hamilton's buildings, near Wooler, also has on his farms a piece of rotting ground, that brings on the flukes also, which he cannot venture to pasture with sheep towards the close of the season, till it first has had two or three nights of frost, and then he considers the danger as considerably reduced.

Dung greatly promotes the growth of very rank

tath; hence allowing horses and black cattle to pasture among sheep is injurious, and as this is most frequently practised in soft, rough, boggy lands, which are fittest for black cattle, it is still worse, for they break the surface of the ground with their feet, and bring up mire and dirt, which taints the grass.

Another cause inducing rot, is breaking up large fields for corn, in the sheep-walks, and after they have been quite exhausted by cropping, laying them out again for pasture. If the first summer thereafter happens to be dry, very little, if any thing, grows upon them; but if it proves wet, there is also very little grass, but a great deal of sorrel, chickweed, and other weeds and trash, which the sheep are very fond of, and are full as soft, watery, and as injurious as tath. The consequences are often very bad, and as the ground is never quite sound, until it is covered with the same thick, short grass, and regain the same surface it had before it was broken up, it will require five, and in some places, seven years before it recovers.

There is still another cause which often occasions great loss by rot among Highland stocks, and that is, when sheep are severely pinched with hunger in a storm. This, as has already been stated, is sometimes considered as a distinct species, under the name of *hunger rot*, an opinion which Mr. Beattie thinks should be received with some limitation. It is certainly true, that, in soft grounds, the rot is apt to break out with most violence after the sheep have been starved in a storm; but when they are so

famished, they devour the tops of rushes, broad bent, and every thing that appears above the snow, and when they get down to the soil, after casting the snow, they gnaw up the roots of the grass, and break the very surface of the ground, swallowing sand and mud, and whatever comes in their way; so that although it is undeniable that the rot often breaks out most violently after a storm, and that it will then appear on ground where it is unknown at other times. "I am still slow in believing," adds Mr. Beattie, "that hunger itself, unassisted by any deleterious food, will induce the rot. I rather think they are poisoned by being reduced to eat such unwholesome food as they will not touch at any other time; for in the course of my experience, I have several times known sheep, when sheltered by a rock, where they could get nothing, overblown with snow, and lie there until they had endured hunger beyond credibility, and yet be got out alive, and prove quite sound afterwards. I have likewise known sheep on a very sound ground, where the surface was firm, and no tath or bad food to be got, so reduced by hunger in a storm, that they died of downright hunger, and yet as free of rot, as the day they were lambed, and the stock that survived, proved as sound as any stock in the kingdom.

Other misfortunes affect only individuals; but a hard and severe winter brings a whole stock under its ravages; hunger and fatigue waste their strength, and subdue their vigour; the excessive frosts benumb and decay the very springs of life, which for want of fat, are now exposed to the nipping gales.

Overstocking operates nearly in the same way as a storm, as the more they are straitened for food, the nearer the surface they will go, and the more sand, mud, and roots of tath will they swallow; and although it seems not easy to determine, whether mud of itself will introduce the rot, as sheep never swallow any of it, but when they have the tainted roots of the tath along with it, yet as it is a most unnatural food, we may certainly conclude that it is unwholesome.

Overstocking spoils sheep of all ages and descriptions. Hungering in summer ends in starving in winter; and in long continued severe weather, the whole may be in danger of being lost.

Whatever injures the constitution, or tends to debilitate sheep, also renders them more liable to be affected with the rot. Nothing contributes more than a course of changeable weather from one extreme to another, to waste sheep, and nothing is more difficult to guard against, which has given rise to the proverb,

> Mony a frost, mony a thow,
> Soon makes mony a rotten ewe.

Overheating sheep in autumn by severe dogging, or rash and inconsiderate management, has also the worst effects in breaking their spirits, and wounding their constitution. Ever afterwards they feed only on soft tathy meat, which always insures rot in the spring. Ewes, and especially gimmers, which have been debilitated by being milked, or sucked too long, commonly suffer. The rot may be also considered as an hereditary disease, at least the lambs of tainted ewes are never sound.

The rot never affects sheep which have plenty of

food and good shelter. Hence pet sheep never suffer from it, although their food is often of a very improper nature. It is almost unknown on hard dry sheep lands, where the water runs off as soon as it falls; and sheep that have access to the shores of the sea, or to salt-marshes, are hardly troubled with it. On walks where heath abounds, it is not common, although it is frequent on green hills in the same neighbourhood, equally dry; nor is it very prevalent on mosses, notwithstanding their excessive moisture. "This remark," says Mr. Singers, "may account for the well known fact, that in the Highlands of Scotland, the rot is little known, although the climate is moist, and there are great tracts of wet soils; but in these walks there is plenty of heath, an immense extent of sea shore, along the vast and numerous arms that run from the sea, and intersect that mountainous district, and very large tracts of dry rocky sheep-walk interspersed. These fortunate circumstances render the pasture of the Highlands of Scotland sounder from rot, and safer from storms, than the green walks of the Cheviot hills, or those of the head of Roxburg and Dumfriesshire."

"The coincidence of rank tath grass, wet soils, summer-flooded lands, soft grasses in rich land, and moist seasons, in producing this disease, is striking. I remark too circumstances, in which all these causes of rot seem to coincide. One is a superabundance of fluid in the food; and the other is a deficiency of free sun and air, to elaborate the plants. Both the characters must constitute real defects in

the grass; and they are both apparent, less or more, in the tath rank grass of all sheep-walks; in the produce of soils naturally too wet, in that of lands pushed into excess by summer-floods; in the soft grasses that rise thick and quickly in rich soils, containing too much moisture; and in the general growth of wet seasons. Even in overstocked pastures, there are tufts of rank grass arising from animal manure lying in superabundance on the ground, which must be liable to the two objections above mentioned. When vegetables rise too fast, and too thick, they are never wholesome; over-manured corn or potatoes are unpleasant and unhealthy food: even the trees that grow in soils excessively rich, and want free sun and air, become what the woodman calls crashy, or spongy and brittle in the grain, and unfit to stand in durable work.

These defects in the vegetable substance and organization, are only comparative. The grass that rots sheep, is also unfit for posting horses, and breaks their wind: it even retains this defect, after it has been made into hay; yet in this state it may answer working horses, whose pace is slow and exertions moderate. But for milk cows, it has not been ascertained, that sheep rotting grass is in any degree injurious. The excess of fluid adds to the quantity of the milk, and is thereby drained off; but the quality of the milk is confessedly inferior.

"It is well known, that the combined influences of light, heat, and air, are necessary to perfect vegetable substances; and even to maintain their health and specific characters. It is also certain that in or-

der to have them sufficiently prepared in the laboratory of nature, they must not be unnaturally pushed forward into rankness, but must have proper time allowed them to vegetate. A single stole of corn growing in a dung-hill, has plenty of air, light and heat; but it becomes rank by excess of manure, and rots instead of ripening. Excess of fluid is manifest in all the kinds of grass that induce sheep rot; they also appear to be defective in fibre, as excess of fluid seems to imply, and their softness further indicates. But assuredly the juices and parts are imperfect in other qualities also; their rankness appearing to impede that regular process of nature, in the course of which all their parts arrive at maturity. The sap appears to be propelled to excess; while the necessary secretions, transpirations, and absorptions, are at the same time disturbed.

"These defects in the grass of summer-watered lands, may probably become more conspicuous, by reason of the extraordinary vegetation that takes place at this period, and pushes the rising grass into higher degrees of excessive luxuriance. Plants watered in autumn extend their roots greatly, indeed, and are thereby in readiness to push up vigourously next spring, but the ascent of sap in the stalks, is checked by the season. Spring watering both extends and feeds the root and stock; but nature at this season requires the large supplies of moisture, with which the earth abounds, for carrying up the stalk and leaf of grasses; whereas in summer, she requires more sun, in order to form and mature the seed. Accordingly we see, that a very dry,

spring and moist summer appear to invert the demands of nature, and are fatal to the crops of grass, in point of quantity and quality also. It must also be observed, that the leaves of plants transpire most early in their season and gradually lose a portion of this power; they must therefore be injured more in summer by excess of fluid, than in spring, when they can more certainly throw off the excess. If these causes are not thought sufficient to explain the superior comparative defects of summer-watered grass, above those of grasses watered in autumn or spring, it should be remembered, that though the fact is well known, the attempt to explain it is almost wholly new. I shall therefore add only the following remarks: that though moderate watering are useful and necessary to feed grass in summer, yet excess of water destroys it more quickly at that season, than at any other; and excess of water together with stagnation of air, and obstruction of light, at this period, are so visibly injurious to the quality of soft grasses, as very soon to reduce them to a putrid mass.

"But there seems to be another obvious cause of danger to sheep from summer flooded lands, pastured by them immediately afterwards. The spawn or eggs of the liver fluke are most probably conveyed upon the grass by this operation, and afterwards taken into the stomach with it. This may readily happen by summer watering; whereas, there may be no spawn to float in the fields in spring, and if wafted thither by harvest waterings, the frosts of winter may destroy the animals before the spring

following.—The *fasciola hepatica* must be bred from spawn, conveyed into the seat where it is found, by the blood, or some other channel; for we cannot admit of equivocal generation in the production of this insect; and I see no way of accounting for it more naturally than the above. Rotting grass in general, and particularly summer-flooded pastures eaten off immediately thereafter, operate probably not only to prepare a nidus for the fluke, by rendering the liver of sheep diseased, as weak stomachs loaded with phlegm, breed worms in children; but also to convey the spawn of the insect itself into the sheep's body. The admission of this account of things would furnish an obvious explanation of certain interesting facts relative to the rot, for which no cause has yet appeared.

"The deleterious effects of rot grasses upon sheep, may be farther illustrated by the following observations. The grass always looses a very great proportion of weight when cut green and dried; not less, generally speaking, than seventy parts out of an hundred; when sound healthy grass, taken at the same time, looses only about sixty parts out of an hundred; or less, according to the degree of its maturity. This excess of watery fluid in rot grasses accounts for the observation that has been often made of them, which is, that they scour sheep, rather than feed them; an effect which is very injurious to these animals.

"It ought also to be noticed, that a ewe that is giving suck to a lamb, can safely bear a greater proportion of fluid in her food, as the milk operates like a drain for it; which may counteract the dangerous

effects of excess in this particular, as happens to a milk cow; but cannot prevent the bad effects of grass, in other respects unhealthy. Only, it is possible to believe, that the strong appetite and digestive powers of an animal giving milk, may overcome dangers in the quality of its food, which might otherwise have manifested bad effects. And if ewes and lambs be in less danger than other sheep, from grass having a tendency to produce the rot, we may probably find this a rational account of that distinction." Mr. Singers.

It is not exactly ascertained, in how short a time a sheep may be infected by feeding upon tainted grass. "I was upon a reference," says Mr. Beattie, "when a witness deposed, that he had known sheep tainted in one night, and assigned as the cause of his knowledge, that he saw a parcel of wedders bought by three men off a very sound ground; the men divided them into three lots; the grounds they were to pasture them upon were all equally sound; but one of the lots having farther to go, did not reach its pasture that night; it was therefore inclosed at dark, in a cow-fold, and taken out very early next morning, and put upon its pasture. Several of that lot proved unsound, but none of the other two lots. A night seems to me rather a short time, but I have seen some instances, which incline me to believe that they will catch it in a week, although for the most part, it certainly requires a longer time." On this subject, Mr. Singers quotes the following fact from Mr. Arthur Young. Twenty South Down ewes were lost by rot, which got into a summer-flooded

meadow, in Sussex, only for a single night before dropping their lambs, while the other ewes which were kept out till they had their lambs, which happened about Christmas, or soon after, were then admitted into the same meadows without danger.

With regard to the season in which sheep are most exposed to the danger of being tainted, Mr. Beattie has the following observations. "In summer, as the influence of the sun is strong, unless it proves extremely wet, there is not much danger; in harvest, especially the latter end of it, if the weather is wet, mild, and growing, the danger is very great; it is equally so in the beginning of winter, as long as the weather continues soft and growing; but so soon as the frost sets in fairly, the danger is over; the the tath, it may be remarked from its softness, is now shriveled and withered almost to nothing, the noxious moisture is quite exhausted, and the sheep are not so fond of it; so that unless they are compelled to tear up the roots of it in a storm, there is little danger to be apprehended from it in winter. But in spring, especially in March and April, if the weather is soft, the danger is great; for the sheep are commonly in a low state, from coming through the winter, the ground is then bare, and if tath arise, it is young, soft, and watery, and the sheep, from scarcity of food go to the very roots of it; and after an ewe has lambed, she is often so straitened to support herself and lamb, that she devours all she can meet with, and it is very apt to catch the infection."

"It is impossible to say, with any degree of precision, how soon it will discover itself after infec-

tion; it is so in various different sheep, different grounds, and different seasons. Some that have contracted the taint in the end of harvest, will shew evident marks of it in February, and die soon; others will live till Whitsunday, and die when the weather turns warm. Some of them will seem to be tolerable sheep as long as they are unclipt, and after clipping will cease to thrive. If the taint has been pretty general, they will continue dying through the whole year; but if it has been but slight, and a dry summer should succeed, their constitutions seem to recover, and they will live for several years, and take on flesh, and thrive just as well as sound sheep; but although the disorder is dormant, it is still in their frame; for which reason experienced shepherds, when they have any suspicion of their stock being tainted, draw out and sell many more of them than at any other time; neither do they thus any injury to those that buy them for feeding; for when they are in this state, they will feed in warm fine pasture, nearly as fast as any sheep; but when they remain upon cold Highland grounds, they can never endure hunger, hardships and winter storms, like sound sheep, and still die rotten at last."

Preventives.—The most deadly lands have become comparatively sound, by proper draining. After this operation, many parts of a farm, which only produced spirits and coarse grass, will soon become covered with the finest verdure. Wherever it is practicable to draw off great bodies of water at once, the method of the celebrated Mr. Elkington, of Warwickshire, should be adopted; but in gen-

and the small sheep drain, as it is called, is preferred, sloping gently across the declivities of the wet soils. This, when properly executed, never fails to be of great advantage; and it is not expensive, as it may be executed for a penny every six yards.

To preserve the small sheep drain from destruction, it becomes necessary to destroy the moles. They are very pernicious in sheep pasture, and work much in wet as well as in dry land. Particularly where it is drained, they destroy much of the best grass. From the lower sides of the drain they cut passages to the surface of the soil, by which the water escapes, while the mole-hills being washed over the surface, act as manure in raising tath. The drains themselves in time get choaked, and perfectly useless. The moles must therefore be destroyed, which experienced mole-catchers will do at so many shillings per hundred acres. Landlords and tenants are equally interested in these improvements, and should go hand in hand in them. Thus when Archibald Irwin took the once rotting farm of Overdumfiddling from his grace the duke of Buccleugh, he engaged to drain out the rot, provided his grace would extirpate the moles, and it is now as sound a farm as any in the country.

Low and hollow lands are often unnecessarily flooded where waters and rivulets run in a winding and crooked direction, occupying perhaps ten times more space than they ought to do. Heaps of sand also collect in various parts of their channel, which accumulate until they force the water to take a new course, and on every increase to overflow the banks,

covering the neighbouring flats with sand, mud, &c. In such circumstances, the channel of the rivulet should be deepened, and made as straight as possible. Upon certain parts of the lower lying lands, where the descent for the water is very gentle, and little more than perceptible, and where a flood is sure to overflow the banks, what are called fleet dykes ought to be raised. These dykes may be made of turf, two and a half or three feet high, and a few yards back from the banks of the stream, for the purpose of more effectually preventing the waters from overflowing the adjacent flats. By this means a flood would have its bed sufficiently enlarged, and would also in its course be confined to its proper channel. Some small annual repairs, which the shepherds themselves might execute at their leisure, would be sufficient to keep these dykes in order.

There are circumstances, however, in which draining is prejudicial. "But I must here make a distinction," says Mr. Beattie. "If the surface is green, either bog, or soft ley, draining is a principal preventive; but if the surface is black, that is, either peat, moss, or flow, it must not be attempted, as I have found by experience it does much harm. For there is something strange in the nature of moss ground; the more water that stagnates upon it the more food for sheep it produces, and it never will produce any thing that has the smallest tendency to introduce the rot; for as it produces no grass, it can produce no tath, but only moss, ling, and deer-hair; which are not only firm sound food, but by coming so early (for the ling will draw in the

middle of February, if the weather is fresh) in early springs, will raise Highland sheep, that have plenty of them, to order, superior to sheep that feed in lower grassy lands; and as sheep pull them up by the roots, they get more benefit from the clean white roots than from the stems. These all flourish most in water, and if you drain moss ground, when you have it completely dry, it will be completely useless, as it will produce nothing at all."

On many rough boggy grounds a mixed stock of sheep and black cattle are pastured promiscuously; the latter affording some profit, but the former proving of little value.

The pernicious effects of nolt-tath have already been mentioned. The remedy is obvious. Avoid pasturing cows, and more especially horses, among your sheep. "I have found by experience," says Mr. Beattie, "that far more grounds, if properly drained, and kept clear of horses and black cattle, will keep a sound stock of sheep than is generally imagined; for although many people have tried the experiment, and failed, the reason seems to be, that they have never given it a fair trial. Ground that has been broken up with the feet of black cattle, and tainted with their dung, will, like land that has been broken up for cropping, require five, and sometimes seven years, to come fairly round; and though you free it of the nolt, so long as it has not regained a sound surface, and whilst you observe the grass of a blacker colour, you may be certain that the effects of the nolt-tath are not exhausted, and the sheep will do little better than when the

black cattle were among them. When farmers observe this, they think it folly to lose the profits of their black cattle, and the sheep no better, and they bring the black cattle among them again; whereas, if they would persevere, although with some loss for a while, I think that in the end they would generally succeed."

The importance of excluding horses from a sheep-walk is also strongly stated by Mr. Laidlaw. "Great praise is due to his grace the duke of Buccleugh, on this account, as well as for his other attempts to introduce a spirit of improvement into this part of the country. By express stipulation with his tenants, he obliged them to build a park for keeping such horses as were off work. Nor can this be deemed an arbitrary regulation of his grace, for the generality of mankind, especially those whose improvements are in their infancy, are so blindly devoted to present profit, that nothing less than express stipulations will do; and when it is considered, that, after all, his grace's lands are much below what public offers would raise them to, he may be said to lay all the improvements out of his own pocket. I have witnessed the beneficial effects of the above to be already considerable."

When sprit looks as if it would lie down it should be mown, and then the surface, being exposed to sun and air, will produce no unwholesome food. Spots of rank soft grass ought also either to be mown for hay in July, or eaten closely down at two seasons, viz. in spring by the ewes and lambs, and again early in harvest by the young sheep.

"If there be water meadows on the farm," says Mr. Singers, "and the sheep be suspected of danger of rotting, the meadow ought to be inclosed, which places them at the farmer's command. In spring he may freely pasture his meadows; if he incline to do so, they will greatly improve his ewes and weak lambs. But he must on no account water the meadow after the hay crop, for sheep feed. The main feeders and drains should be so laid out as to dry the meadows perfectly, at pleasure, which renders them even safer than in their natural state of haugh, bog, or springs; and by inclosure and due precautions, the water meadows in England are of the first importance for the sheep, without any danger being incurred. This system is also beginning to find its way into Scotland, without occasioning any losses by rotting."

Any portion of a sheep farm which may have been unavoidably broken up for cropping, should be inclosed until it is again covered with wholesome grass.

The advantages of light-stooking are almost incalculable; it wards off the rot, and strengthens and improves the flock, which, though fewer in number, is better in quality, and greater in value; and even if sheep in good condition should be affected by the rot, they may be disposed of in an early stage, with little or no loss; but lean sheep when rotten are useless.

When sheep are in danger of being compelled by hunger to eat unwholesome food, keep plenty of meat among their feet, and in a storm either remove

them to some lower pasture, or give them plenty of turnips or hay. On many sheep farms, indeed, it would be difficult to raise a sufficient supply of turnips; but lands that rot sheep, especially since irrigation has been introduced, will always produce hay enough. In the same manner, when the winter and spring are dangerously moist, let the sheep have access to a stock of good sown grass hay, or to hay of dry leys, or any other well-made hay, of a fine pile, once a day, or towards the afternoon or evening. The small pickings they take of this hay are useful to correct the danger arising from excess of fluid.

If the stock-master has salt marshes at command, he considers his sheep safe; or suspected sheep may be allowed to pasture along the shores of the sea, and to eat the grass impregnated with salt by the tides or spray, or the sea-weeds which they pick up within flood-tide mark. When there is no access to salt marshes or the sea shore, the suspected sheep may be removed into clean dry walks, where heath grows on a gravelly soil, and is in a proper state for eating. As aged sheep run the chief risk from this disease, and young sheep are in danger from sickness, at the same time, Mr. Singers advises to transfer the aged sheep to clean heath, and the young to bent grass, at the same season, or rather, to give each the range of the whole farm as they incline, only taking care to remove each kind, from the place suspected for inducing its particular disease, at the critical period.

"Although artificial grasses," says Mr. Singers,

"in sheep walks, can never bear any considerable proportion to that natural pasture on which the flocks must depend, yet it ought not to escape our notice, that the farmer who dreads the rot may do some good by sowing out his fields with a mixture of such grasses as are considered good to prevent that disease, mixed with the ordinary pasture seeds. And when these grasses are in a proper state for pasturing he may select any suspected animals, and admit them. For this purpose I recommend the following seeds, viz.

1st. Rye-grass. *Lolium perenne.* It is an early grass, and one of the soundest and most profitable for sheep and horses that has yet been cultivated. It also admits, and even requires, to be close eaten down, and that frequently. The fibre is strong and the grass nourishing at the same time. For pasture the farmer must avoid the annual seed; although, for a single crop of hay, the annual seed is best, and yields the heaviest crop. Nothing but ignorance of the qualities or management of rye-grass, could induce any farmer to depreciate it. Let it be regularly and closely eaten down, and it does not run to seed; or, if cut into hay, let it be mown in the flower, and no hay is more nourishing.

"2d. Rib-grass. *Plantago lanceolata.* An excellent sheep-pasture, strictly perennial, and enduring a great deal of eating throughout the season. It is a natural plant on dry sound walks, and of use to thicken the pile of rye-grass, and vary the pasture.

"3d. White trefoil, Dutch clover. *Trifolium repens.* This humble but sweet plant delights in a

dry sound field, properly cleaned and limed; and it is itself the delight of sheep. A mixture of it, and of the two former seeds, constitutes one of the best sheep pastures that can be formed by the industry of man. This species of clover is also perennial, and enriches instead of robbing the soil. I have generally noticed this to be the most abundant plant in sound, rich, improved pastures; but have seldom seen it in lands remarked for inducing the rot among sheep.

These valuable seeds being provided, the following may be mixed along with them, in any convenient proportion, chiefly as medicinal for the rot, viz.

4th. "The seeds of millefoil, yarrow, *Achilea millefolium.*

——— Field mint, *Mentha arvensis.*

——— Scottish parseley, *Ligusticum Scoticum.*

——— Fool's parsley, *Aethusa cynapium*; and in general those of every astringent and aromatic plant that can conveniently be procured, including cresses, thyme, &c.

"A small mixture of such seeds as these may without much difficulty or expense be obtained, and must be of use to the sheep, when sprinkled, as convenience admits, in their pasture fields.

"5th. A number of valuable plants are found to rise spontaneously in our soundest sheep-walks; yet most of them, if desirable, may also be propagated by seed. The plants of millefoil, above mentioned, are often very abundant naturally; and also those of

broom, *Spartium scoparium*, whins, or gorse, *Ulex Europæus*, sheep sorrel, *Rumex acetosella*, and junipers. On a farm liable to the rot, a park of old grass, intermixed with these and other astringent or aromatic plants, acceptable to sheep, might prove a valuable acquisition to the farmer, by furnishing a proper receptacle for a few sheep under suspicion of this distemper.

"Let it be observed, among the last hints suggested for the purpose of curing or preventing the rot, that barks are considered exceedingly good, for counteracting this disease, chiefly those of the oak, elm, and sallow. But it cannot be recommended to admit sheep into plantations of young trees. A safer and readier method may be, to cut off some branches of oak, elm, sallow, pines, and other trees, and to throw them immediately into the sheep's inclosure, where diseased animals have been confined. They will readily fall to work and brouze on some of them, directed by nature, if they be of service to them: for sheep frequently do eat the barks and branches of these and other trees, when they have liberty to resort to them, while young, and within reach."

Shelter in winter is almost as necessary as food; and the want of it is often productive of bad consequences, by impairing the strength and vigour of the sheep. Stone rounds, or small inclosures capable of holding ten or fifteen score of sheep, and about six feet high, seem best for them in the season of storm and distress. Walls also built in the form of an H or X, or of a semicircle, are remarkably use-

ful for preserving them from the violence of boisterous rainy weather, or the chillness of dry cold winds, and upon extensive farms, small plantations upon different corners of them might prove highly beneficial. In placing the means of shelter and retreat in bad weather, care should be taken to have them upon suitable parts of a farm, where they may be at moderate distance, easy and convenient for the different hirsels, each of which should have its own round, as near its pasture as possible. They should always be built in low situations, protected from the wind, and if possible, where two waters or rivulets meet. Without such protection, the sheep must stand exposed all the time, or be driven a mile or two, by the violence of the storm. The uniform soundness of pet sheep is undoubtedly owing as much to their protection in winter, as to the food which they eat.

On all soft grounds stocks should be kept young, for by eating great belly fulls of soft grass sheep break down in their bodies, and fail much sooner than when fed upon hard sound land. When their constitution begins to fail, even their accustomed food will not support them: and besides their teeth get so wide, that they cannot eat fine grass, and are obliged to take to the tath, which subjects them to rot.

It is scarcely necessary to observe, that every thing which tends to debilitate sheep, or hurt their constitution, should be carefully guarded against. They should be dealt with as gently as possible, and never severely dogged. The lambs should be wean-

ed as early as possible, and the ewes never milked on any account. Gimmers, if too long suckled, are sure to rot, and go wrong the following spring, when they are finishing their third year.

In short, as Mr. Bryden justly observes, the best means of preventing rot, is to keep sheep at all times at a regular maintenance, and neither give occasion nor opportunity for a sudden decay.

Cure.—As soon as there is any appearance of the rot, such food as they delight in should be offered to them, and their appetite excited by a little gentle exercise. As long as their bellies are light, a bite of broom, heather, or sea-marsh twice a day, will in general recruit them. Salt is a known antidote in this disease. Sheep are also naturally fond of salt, when they have free access to it. They have been known to run to salt in wooden buckets, and to lick the salt bags hung up in their folds; to eat salted hay and to drink out of cisterns having salt in solution among the water. On a small scale, it may even be given in water by the hand, and poured down their throats. Of all medicines, it is the safest and most effectual against this distemper.

With respect to the cure of it by medicines, little can be said with certainty. The leaves of elecampane, coltsfoot, honey, plantain, foxglove, &c. have all been recommended, but undeservedly, except the foxglove, which seemed to Mr. Stevenson to arrest materially the progress of the disease in those cases in which it was tried. A handful of the leaves was boiled in a Scotch pint of water until it was reduced to three mutchkins, and of this decoction two tea

spoonfulls were given three times a day, with a little molasses and water.

The following receipt has been recommended as very efficacious. Steep four pounds of antimony in two gallons of ale, for a week, and give the sheep a cupfull of it night and morning.

An Account of the Management of several Fields of SPRING-WHEAT, *belonging to Mr. Robert Brown, Farmer, at Markle, near Haddington.**

[From the London Society of Arts.]

THE autumn and winter of 1799 being extremely wet, rendered the sowing of wheat, except in a few situations, almost impracticable. I therefore determined to postpone sowing my wheat seed till the spring months; trusting, as my ground was in good condition, that if the weather was then favourable, I could get the business accomplished in a proper manner. The land was therefore ploughed in as good order as possible; and from the uncommon frosts which afterwards prevailed, it turned very mellow and fine when dry weather arrived.

About the 20th of February, 1800, I commenced sowing, which was continued, as circumstances permitted, till the middle of March; and in that time one hundred and forty-five acres were sown, besides ten acres afterwards ploughed down. The soil of the greatest part of the land thus sown, was a deep loam incumbent upon clay; and the remainder was a lighter loam upon a gravelly bottom.—Thirty acres had been summer-fallowed, limed and dunged, the preceding year. Ninety-five acres were after a crop of drilled beans, which had been

* This communication obtained the silver medal, or twenty guineas, at the option of the candidate, awarded by the London Society of Arts, and particularly demands the attention of the farmer, when bad seasons prevent the autumnal sowing of wheat.

completely horse-hoed. Fourteen acres had been occupied by turnips and potatoes, both drilled and horse-hoed; and six acres had carried summer tares. None of the fields received more than one ploughing, after the preceding crop was removed, except those under summer fallow; which had seven ploughings, and were manured with fourteen double horse cart loads of dung, and three hundred bushels of shell lime per acre.

The kind of wheat sown was principally the Essex white and Egyptian red, which in shape of head and size of grain are nearly similar. Some of the white wheat was of Kentish variety, which from being long sown upon the farm, was much blended with red wheat. The crop upon the heavy loams was with a few trifling exceptions, uniformly good. —The light loam was much hurt by the growth of yellow weeds, which last year prevailed upon such soils in an uncommon degree. The whole was ready for the sickle about the first week of September, and was cut from the 3d to the 12th of that month. A sample of the Essex kind accompanies this paper.

From the small quantity yet threshed, the produce cannot be exactly ascertained; but from trials which have been made, it is supposed that the fields sown after summer fallow, will yield forty bushels per acre; those sown after beans thirty-six bushels, and those after tares, potatoes and turnips, twenty-four bushels. The last being upon the dry soil were much injured by the drought and yellow weeds, while the deep loam was rather benefited by the dry weather.

The weight of the grain already threshed, is nearly sixty-two pounds per Winchester bushel.

The inferences which may be drawn from the above statement, are,

First, That wheat may be sown with advantage in the spring months, till the middle of March, if the weather is then dry, the land in good condition, and the succeeding summer moderately warm.

Secondly, That under the above circumstances, the period of harvest is not retarded above ten days by the late sowing, especially in favourable seasons.

Thirdly, That the grain produced from spring crops of wheat is equally good in quality, as that sown in the autumn and winter months.

On the Destructive Effects of the Aphis and Blights on Fruit-Trees; with useful Observations for preventing them. By Thomas Andrew Knight, Esq. of Elton, near Ludlow.

[From the Transactions of the London Society for the Encouragement of Arts, Manufactures, and Commerce.]

SO many writers on gardening, and on general agriculture, have treated on blights, and so many different theories have been offered to the public, that the subject may appear to many, to have been already sufficiently investigated. The Society, however, entertained a contrary opinion; and, having expressed a wish to receive farther information, I avail myself of this opportunity to lay before them some remarks, which I have at different times made, during several years of rather close attention to the subject.

What are usually termed blights, in the vague and extensive signification of that word, appear to me to originate from three distinct causes:—from insects, from parasitical plants, and from unfavourable seasons.

The destructive effects of the aphis on wall-trees are so well known to every gardener, as scarcely to require description. The leaves curl up, the fruit drops off, and the progress of vegetation is almost totally suspended. Much ill-applied labour is often used by the gardener to destroy these insects, though they are not very tenacious of life. Anoth-

er more extensive, but less fatal disease in plants, the honey-dew, is produced by this insect (as described by the Abbe Boissier de Sauvages.) It has, however, been contended, that the honey-dew is not produced by the aphis, but that it is a morbid exudation from the plant; at least that there are two kinds of it; because the leaves are often covered with honey on trees where the aphis is not found, and because the aphis is sometimes found without the honey-dew. But to this it may be objected, that honey, not being a volatile substance, will remain on the leaves till it be washed off by the rain; and, when moistened by the dew, will leave the appearance of a recent exudation; and that the aphis certainly does not afford honey at any period of its existence. I have frequently placed plates of glass and of talc under the leaves of fruit trees, on which different species of the aphis abounded, and I have found these substances to be in a few hours covered with honey; and I have at other times distinctly seen the honey fall from the under sides of the leaves, where these insects abounded, by the following means. Having placed a small branch, containing a numerous colony of insects, in the window of my study, where the sun shone strongly upon it, I closed the shutters so as to exclude all the light, but that which fell directly on the branch. In this situation the descending drops of honey became extremely visible by refraction, and appeared evidently to be emitted from the insect with considerable force. Each drop contained many minute white points, which I considered as the eggs of the aphis; but, as I knew that

the modes of generation in this singular insect had much engaged the attention of naturalists, I did not examine with sufficient attention to decide that point. This species of insect appears to require a previous disposition in the tree to receive it; and its first attacks may thence be considered as symptomatic of a previous ill habit in the tree: for I have found that trees which have lately been transplanted, have totally escaped its attacks, when every other tree, of the same kind of fruit, growing in the same situation, has been nearly destroyed. And I can assert, from many experiments, that if every peach and nectarine tree was to be dug up once in every five or six years, and to be replanted with some fresh mould round the roots (which should be as little injured as possible,) a much larger quantity of fruit, and of a very superior quality, would be obtained. It is unnecessary to inform the experienced gardener, that the tree should be removed early in the autumn; that its branches should be considerably retrenched, and that it should not be suffered to bear a heavy crop of fruit in the succeeding season. I have never found any species amongst the numerous and prolific genus of the aphis, which was not readily destroyed on the wall-tree by covering it with a sheet of canvas, and under that introducing the smoke of tobacco. It is, however, necessary that the fumigation should be repeated twice or thrice, with intervals of four or five days. I have often seen the addition of sulphur recommended, and have known it tried, but always with fatal consequences to the tree, as well as to the insects.

The blossoms of apple and pear-trees are often said by farmers to be blighted, when they are destroyed by insects which breed within them, or in their fruit; and the same term is used, when the leaves have been eaten by the caterpillar: but as the insects themselves, as well as the manner in which their depredations are made, are extremely obvious, they do not properly come under our observation when treating of blights.

The species of parasitical plants which are found in the form of disease on other plants, appear to me greatly to exceed the number of those I have any where seen described by botanical writers. Of these the mildew is the most common and obvious. If a branch, infected with this disease, be struck by the hand in calm dry weather, a quantity of white powder will be found to fly from it; and if this be received on a plate of talc, or of glass, and examined by the microscope, it will be found to consist of very numerous oval bodies, evidently organized. There is another plant similar to this in every thing but colour (being of a tawney brown,) which is not unfrequently found on the leaves of young apple-trees.—Both these plants appear to me to be evidently species of mucor: and as much the greater number of species of this genus of plants is found to flourish in damp air, and in situations deprived of light, it may be supposed that the foregoing diseases might be prevented or removed, by placing the plants at proper distances: but I have not found this to be the case. They, however, abound most in low and sheltered situations; but they are not unfrequently

seen in those of an opposite kind. The red and white mould on hops, and the black spots on stalks of wheat (the rubigo of Virgil,) and many other diseases of plants, will, I think, be found to arise from the attacks of minute plants of this genus, which appears to me to possess qualities somewhat similar to the digestive powers of animals.

The most common and extensive causes of what are termed blights remain still to be described, and evidently exist in the defects and sudden variations of our unsteady climate. Whatever be the cause by which the sap is raised and propelled to the extremities of trees, it is well known that its progress is accelerated by heat, and that it is checked, or totally suspended, by cold; and it has been ascertained by others, as well as by myself, and indeed is known to every experienced gardener, that a plant under the most skilful management does not readily recover its former vigour, when it has been injured by exposure, for a few hours, to a temperature much below that to which it has been previously accustomed. It frequently happens in this climate, when the blossoms of our fruit trees are just expanding, that a very warm day succeeds a night whose temperature has been some degrees below the freezing point of water. In such a day the evaporation from the unfolding leaves and blossoms will be greatly increased by the agency of heat and light, whilst the supply of nourishment is in a great measure cut off by the ill effects of the preceding night. The blossoms will nevertheless unfold themselves, but will be unproductive, from the want of due nourish-

ment; whilst the hazy appearance of the air, which almost always accompanies such weather in the spring, will induce the gardener unjustly to infer that the ill effects he observes have arisen from some quality in the air (distinct from excess of heat and cold,) which he denominates a blight.

The best defence against this kind of weather for wall trees, that I believe has yet been tried, is a covering of a double and triple net; for by this the tree is in some degree protected from frost; and the excess of evaporation, in the succeeding day, is in a very considerable degree prevented. Lightning is supposed by many to be very highly injurious to the blossoms of trees; but I believe that the ill effects which appear sometimes to accompany it, may be more justly attributed to excessive heat. The careful gardener often covers his trees with mats, or something of this kind; and by almost totally depriving the tree of light, creates that blight which he is anxious to exclude.

As the blossoms of every tree are formed during the preceding summer and autumn, they will evidently be more perfect in proportion as those seasons have been favourable, and as the management of the gardener has been judicious: and as the power of bearing unfavourable weather will be proportional to their vigour, and to the maturity of the annual wood, through which the sap passes to support them, the gardener should be (though he rarely is) extremely attentive to keep his trees in such a state, and the branches at such distances from each other, that they may receive the greatest possible benefit from the

portion of light and heat which our shadowy climate affords them. It frequently happens in pruning, that too much bearing wood is left on the tree. Every gardener ought to know, that where a hundred fruits are a sufficient crop for a tree, he has a better chance to obtain that hundred from one thousand blossoms, to which the whole nourishment of the tree is directed, than when the same quantity of nourishment has to support a hundred thousand.

In standard fruit trees, where no advantages can be derived from covering them, much may be done by the judicious application of the pruning-knife.—The branches of a tree of this kind ought to be much thinned towards their extremities, so that the light may be admitted into the centre of the tree; but the internal parts of it should never be so thin as to admit of a free current of air through it. When a tree has been properly pruned, blossoms and fruit will be found on every part of it: and in unseasonable seasons, the internal blossoms will receive protection from the external branches, which will be unfruitful.

It is particularly the interest of every planter to take care that the varieties of fruit which he plants be sufficiently hardy for the situation in which he places them; for, if this be not attended to, little benefit will be derived from the foregoing observations.

APPENDIX.

Adjudication of Premiums for the Encouragement of the Manufacture of Woollen Cloth, in the years 1818 *and* 1919.

THE legislature, at their session of 1817, revived the law for the encouragement of the manufacture of woollen cloth, which had previously expired. As this fact was, however, known but in few counties, the number of specimens received in 1818 was uncommonly small. The county premiums were adjudged as follows, viz:

Counties.	*Premiums.*		*Names.*
Courtland,	1st	Premium,	Moses Kinne,
	2d	do.	William Wade,
	3d	do.	John Keep.
Delaware,	1st	do.	Isaac Ogden,
	2d	do.	Abraham Ogden,
	3d	do.	Abraham Thomas.
Jefferson,	1st	do.	Samuel Watson,
	2d	do.	Walter Cheney,
	3d	do.	John N. Green.
Kings,	1st	do.	John Wykoff,
	2d	do.	John Drew,
	3d	do.	Nicholas Wykoff.
Suffolk,	1st	do.	Joseph Wood,
	2d	do.	Frederick Hallock.

A piece of cloth was also presented by *Moses Austin*, of Greene county, for a premium, of more than thirty yards in length, and not less than three fourths of a yard in breadth, in pursuance of the provision of the 3d section of the act, passed 19th June, 1812, entitled "an act for the encouragement of manufactures of woollen cloth, and for other purposes."

The Society for the Promotion of Useful Arts, in pursuance of the provisions of the act, entitled "an act for the encouragement of manufactures of woollen cloth, and for other purposes," passed June 19th, 1812, proceeded March 11th, to award the premiums therein named, in the following manner, viz.

To *Abraham Ogden*, of Delaware county, for the first best specimen of domestic manufactured woollen cloth, presented this year, a premium of ninety dollars, in a piece or pieces of plate.

To *Moses Austin*, of Greene county, for the second best specimen of domestic manufactured woollen cloth, presented this year a premium of eighty dollars, in a piece or pieces of plate.

To *Moses Kinne*, of the county of Courtland, for the third best specimen of domestic manufactured woollen cloth, presented this year, a premium of seventy dollars, in a piece or pieces of plate.

By order,

JON. EIGHTS,

Recording Secretary.

In 1819, the following premiums were adjudged in the respective counties, viz.

Counties.	*Premiums.*	*Names.*
Albany,	1st Premium,	Rufus Watson,
	2d do.	Gerrit Oliver,
	3d do.	Apollos Moore.
Broome,	1st do.	Lewis Keeler,
	2d do.	George Keeler.
Courtland,	1st do.	Moses Kinne,
	2d do.	Mead Merrill,
	3d do.	Wm. Wood.
Delaware,	1st do.	Samuel A. Law,
	2d do.	Wm. Townsend,
	3d do.	Isaac Ogden.
Greene,	1st do.	Horace Austin,
	2d do.	James Thompson,
	3d do.	Noah Baldwin.
Herkimer,	1st do.	Rudolf I. Shoemaker.
Jefferson,	1st do.	Eliphalet Edmunds,
	2d do.	Daniel Kinne,
	3d do.	Daniel Eames.
Kings,	1st do.	John Drew,
	2d do.	John Wykoff,
	3d do.	Simon Rapelye.
Madison,	1st do.	Charles D. Huston,
	2d do.	Erastus Cleaveland.
Montgomery	1st do.	Amos Churchill, jun.
	2d do.	Lois Bicknell,
	3d do.	Staunton Clark.
Oneida,	1st do.	Enos Nicholl,
	2d do.	Ethel Barnum,
	3d do.	Stephen Mott.
Onondaga,	1st do.	Eunice Mott.
Ontario,	1st do.	Caleb Philips,
	2d do.	Wells Whitmore,
	3d do.	Daniel Dorsey.
Orange,	2d do.	Joseph Moffat,
	3d do.	Jas. W. Carpenter.

Counties.	Premiums.	Names.
Otsego,	1st Premium,	Moses Hawks,
	2d do.	Elias Bramin,
	3d do.	Joseph White.
Queens,	1st do.	Christopher Sneidekes
	2d do.	Joseph Dourland.
Rensselaer,	1st do.	Joseph Dorr,
	2d do.	Simon Newcomb,
	3d do.	Samuel Milliman.
Rockland,	1st do.	George Suffern,
	2d do.	Nicholas Call, jun.
	3d do.	John S. Coe.
Saratoga,	1st do.	Elias Benedict,
	2d do.	John Sullivan,
	3d do.	Vincent Reid.
Steuben,	1st do.	John P. Ryers,
	3d do.	Elisha Pike.
Suffolk,	1st do.	Joseph Wood.
Tioga,	1st do.	Hannah P. Hyde,
	2d do.	Robert H. Hyde,
	3d do.	Joseph Speed.
Ulster,	1st do.	William Doll,
	2d do	John Loundsbury,
	3d do.	Abraham Brevier.
Washington,	1st do.	Alexander Livingston,
	2d do.	Lewis M'Leall.
Westchester,	1st do.	Silas Finch.

Two pieces of cloth were also presented for premiums, one from Mrs. Janet Montgomery, of Dutchess county; the other from Mr. William Sturges, of Greene county, in pursuance of the provisions of the 2d section of the act, passed 19th June, 1812, entitled, "an act for the encouragement of manufactures of woollen cloth, and for other purposes."

Society's Chamber, March 10, 1819.

The Society met at 11 o'clock, A. M. for the purpose of adjudging the premiums for the three best specimens of domestic manufactured woollen cloth, agreeably to law. The premiums were awarded in the following manner. viz.

To *Isaac Ogden*, Esq. of Delaware county, for the first best specimen, a premium of ninety dollars, in a piece or pieces of plate.

To *Vincent Reid*, Esq. of Saratoga county, for the second best specimen, a premium of eighty dollars, in a piece or pieces of plate.

To *Samuel A. Law*, Esq. of Delaware county, for the third best specimen, a premium of seventy dollars, in a piece or pieces of plate.

By order,

JON. EIGHTS,

Recording Secretary.

Report of the Recording Secretary.

The recording secretary reports, that in obedience to the provisions of the act entitled "an act for the encouragement of the manufacture of woollen cloth, and for other purposes," passed the 19th June, 1812, he has received returns from the clerks of the following counties, detailing the quantity of cloth

exhibited for premiums before the respective judges of county courts, in January, 1819, viz.

Herkimer,	39 yards.
Onondaga,	107½
Albany,	228
Kings,	79
Ulster,	119
Madison,	352
Montgomery,	104
Orange,	164
Jefferson,	183
Greene,	137
Oneida,	270
Suffolk,	150
Sullivan,	110
Rensselaer,	105½
Niagara,	58
Courtland,	249
Total,	2455 yards.

JON. EIGHTS,

Recording Secretary.

Report of the Committee of Mechanic Arts on the Model of a Bridge presented by Mr. William Tilton, of New-York.

In Society, Feb. 18, 1817.

The committee of mechanic arts, to whom was referred the model of a bridge presented to the So-

ciety by Mr. William Tilton of the city of New-York, for their examination and opinion of the same, Report, that they have examined the model, and believe that a bridge built to a certain extent on this plan, might answer a very good purpose; but do not believe that this is either an original plan or the best that ever was adopted.

In the new Edinburgh Encyclopedia, we find the plan of a bridge, that was built across the river Rhine in the year 1758, and stood to the year 1799, nearly on the same plan of Mr. Tilton, but small in the span compared with the one contemplated by him, which he states is 350 feet. To aid your committee, Mr. Tilton has furnished them with the following calculation. He states that in a real bridge, the braces would be 22 inches by 6 inches in thickness; a foot in length of one of these pieces would contain 1584 cubic inches. The stuff in the model is 2 inches by one in thickness, a foot in length of this contains 24 cubic inches, which is 66 times less than the timber in a bridge of full size. If the present model will bear five tons, besides its own gravity, a bridge 24 times as long, and the stuff 66 times as large, would support from 1 to 200 tons, besides its own gravity.

From what data this calculation has been made, your committee know not; but shall proceed to examine it by rules laid down by writers on mechanics, and thereby in some measure determine the value of the invention.

In "Emerson's mechanics," there are the following rules:

1st. The area of a section multiplied by the depth, is the strength.

2d. The weight multiplied by the length is the stress.

3d. If two beams bear two weights proportional to their lengths, and in a like situation, the stress upon each will be as the square of its length.

4th. If two beams bear two weights reciprocally as their length, in a similar situation, the stress when the weights lie, is equal in both.

Then the question will be, if the model be loaded with 5 tons, and the bridge in proportion to its length 120 tons, what will the stress be, and strength required? If the product (according to rule 2d) of the weight multiplied by the length of the bridge be divided by the product of the model, it will equal 576 for the stress of the bridge, when the model is 1. Again, if the stress be 576, to one of the model, what will be the size of the timber, to be strong in proportion?

Any of the three following sizes will answer according to rule 1st. viz.

28 by 9 inches.
24 by 10 do.
or 16 by 12 do.

Equal to 576, stress.

But as every body has to support its own weight, as well as that of its burden, the true answer will appear by multiplying the weight of the whole mass by the length. And if we take the size nearest to the one proposed by Mr. Tilton, it will be 28 by 9, which contains 126 times as much matter, as the

model. Then the product of the whole weight of the bridge, multiplied by 350, its length, divided by the whole weight of the model, multiplied by its length, equals the enormous sum of 54,210, for the stress of the bridge to that of the model.

If these be true results, and your committee believe them to be nearly so, then Mr. Tilton must be wrong, in supposing that 66 times the strength of his model would support so great a weight, at such an extended length, and at the same time, his timber laid on the flat, or in the weakened position, to support itself and its load. Your committee, therefore, are of opinion, that there is no principle in mechanics, which can warrant an experiment of such magnitude, as the building of a bridge on the principles and to the extent of the one contemplated by Mr. Tilton.

All which is respectfully submitted,

JAMES RODGERS, *Chairman.*

Memorial to the Legislature, asking the necessary aid from them to enable the Society to offer Premiums for Improvements in Agriculture, Arts, and Manufactures.

In Society, Feb. 25, 1817.

Resolved, as the sense of this Society, that the liberal encouragement bestowed by the legislature for several previous years on the manufacture of woollen cloth throughout the state, has been produc-

tive of great and lasting advantage to the community.

Resolved, as the sense of the Society, that there are many other objects connected with agriculture, the arts, and manufactures, which deserve the fostering notice of the legislature.

Resolved, That as the legislature have already honoured the Society by making it their agent in distributing the premiums for the encouragement of the manufacture of woollen cloth, it will be considered a mark of confidence, which will be acknowledged with gratitude and pride, should they appropriate any further sums, to be given as premiums, for encouraging agriculture, arts and manufactures.

Resolved further, That the president be desired to communicate a copy of these resolutions to the president of the senate, and the speaker of the assembly, with a request, that the legislature will be pleased to appropriate a certain sum for a term of years, which may be annually distributed in premiums, to be designated by the Society.

MEMORIAL.

The Society for the Promotion of Useful Arts, in the state of New York, deeply impressed with the advantages that have heretofore resulted from the liberality of the legislature, in their appropriations for the purposes of domestic manufactures, beg leave to suggest to the honourable legislature, the propriety and utility of again affording them such aid,

as may be thought conducive to promote the ends of their institution, and which will in their distribution prove highly beneficial to the solid interests and staple commodities of the state, whose welfare and grandeur they have laboured to promote, commensurate with their means.

In reviewing the advantages derived from the premiums on woollen manufactures, and the unprecedented perfection to which they were brought, in a short space of time, the Society trust they merit the confidence of the state, in the judgment and discretion they displayed, in effecting the objects they were entrusted with, and stimulating the ardor of the citizens to accomplish the ends of supplying themselves with various domestic articles of manufacture, from which in a state of war they would have been excluded, or have been put to an enormous expense to obtain. This great desideratum was attained beyond the most sanguine expectations, and if at present they pine under capital and a glutted market, experience demonstrates, that they may again be brought into activity, whenever opportunity or circumstances render it expedient.

In the mean time, and in the great change of events that has taken place in the world, the Society are sensible that no languor or despondency ought to be permitted, but the state should be roused to an animated exertion in discharging its incumbrances and dispelling trifling apprehensions; effectually to do this is to promote the staple articles of our state, to foster such arts as are compatible to our means, to encourage such domestic manufactures

as are profitable, and by every exertion to promote the products of our soil.

To accomplish such desirable intentions, it is obvious, that every attention by the husbandman should be paid to the improvement of his stock; and it is to be lamented that no amelioration has taken place in that first and most essential requisite for many years, the merino breed excepted, though probably every species of stock, when properly adapted to its proper situation and soil, is fully as profitable.

The agriculturalists with few exceptions have progressed but slowly in the tillage of the soil, and in adopting a change of crops, that not only are more productive and profitable, but which experience attests, renovate and mellow the earth, so as to enable it to yield as abundantly as when first cultivated from a state of nature.

The great improvements that have been made of late years in ploughs, and other farming utensils, have been highly conducive to the agricultural interest. The application of composts and manures peculiarly fitted to certain soils, the necessity of draining others, with the advantages of irrigation, are as yet but too little known to expect any solid advantages to result to the public welfare.

To these and similar considerations, in detail too multifarious to be pointed out, the Society wish to draw the attention of the enterprising farmers throughout the state, and by disseminating knowledge founded on practice and experience, stimulate the industry of those who from inexperience, entertain opinions that their lands are worn out and incapa-

ble of returning produce adequate to their pains, while those in possession of richer soils are from an erroneous calculation exhausting their land by a succession of wheat crops and gradually impoverishing themselves and the country.

The Society are fully sensible that this is not the most auspicious moment to present a claim on the munificence of the hon. the legislature; that public burthens render a rigid economy absolutely essential; that the surplussage of industry and frugality which has heretofore been expended in improvements, is much curtailed and exhausted, by anticipated expenditures of a private as well as public nature; but yet in matters of such vital importance, they cannot but hope that the hon. legislature will favourably view the objects of this application, and by appropriating an annual specific sum enable the Society to progress in an undertaking, the result of which will add wealth to the state, vigour to its resources and industry to its citizens, and will authorise the Society to proceed in their career of usefulness and effect the ends of their institution, and ultimately, by their industry and discretion, amply repay whatever advantages the liberality of the honourable legislature may direct.

[The legislature did not act on the memorial.]

Report of the Agricultural Committee on an improved Scotch Plough.

(With an Engraving.)

In Society, March 24th, 1818.

The agricultural committee, to whom was referred the examination of Mr. Rodgers' plough—Report.

That excepting threshing machines, no branch of agriculture has been more interesting or engaged the attention of agriculturalists so much as the construction of ploughs.

That the causes are obvious, and distinctly described in the various works that have treated on that most important point, is satisfactorily apparent; and probably in no one particular have theorists and practical men been more unanimous than on the advantages resulting from the best constructed ploughs, whilst the different opinions and models that have arisen as to their formation, are evidences of the anxious investigations that have been instituted to establish definite principles, and produce conviction: yet even at this period we are not warranted in conceiving the rules so firmly established as conclusively to prove what are the best models of ploughs, precisely adapted to various soils, and embracing at the same time the advantages of the agriculturalist; taking into consideration his locality, stock, and system of cropping.

Your committee will advance one proof of the advantages arising from ploughs used with a team lengthwise: viz. that the ground is not by that mode trodden down in any other part, than the furrow, and if any additional horse is requisite, it is to

On the Management of Bees

Fig. 1

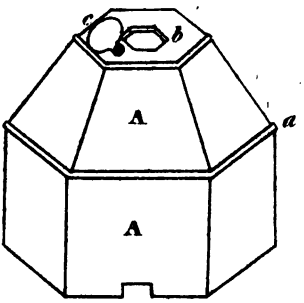


Fig. 2

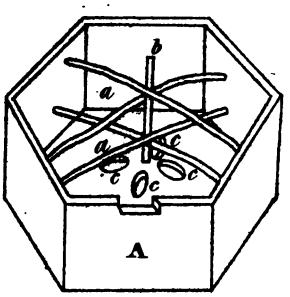
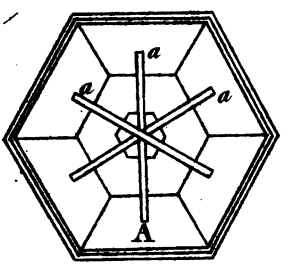


Fig. 3



RODGERS IMPROVED SCOTCH PLOUGH

be remarked, that it is in general a three or four year old colt, which is thus broke and rendered useful and docile without the expense of a horse-breaker, or the attention of any one taken up for that sole object.

It ought also to be particularly remarked, that the strong and argillaceous soils, require a double set of ploughs at least once in four years, as it is the decided opinion of your committee, that those soils should never be cropped more than three years in succession; otherwise the root-weeds and couch-grass increase so much as to render it more difficult to clean the land, while they exhaust the soil equal to a crop: also the necessity of frequently ploughing such soils when the land is too wet, in order to sow the grain in season, renders them harsh and sour: the only remedy to sweeten, and mellow such soils, is to expose them to a winter and summer fallow. The ploughing of the winter fallow, as also the cross ploughing in summer, ought to be performed with a plough whose construction is in general dissimilar to the plough used as immediately preparatory to the introduction of culmiferous crops.

With these impressions, your committee proceeded to examine Mr. Rodgers' plough, and to point out such imperfections as they conceived it to labour under, having in their view the object of promoting enquiry, ascertaining the correctness of their remarks, producing discussions and experiments—which last after all that can be advanced, are the only effectual modes of ascertaining its merits.

As the plough is made after the model of an imported plough, your committee will submit such information respecting the original as they have been able to obtain.

It appears that a plough commonly called the English plough, was introduced some years ago into Scotland, and till a few years since, was generally used, when an enterprising farmer, by the name of John Wilkie, living at Uddiston, near Glasgow, in North Britain, made several improvements in its construction, and styled it the Scotch plough. Mr. Wilkie in the first outset had, as is usually the case, to contend against prejudice, custom and apathy, but being seconded by some young men who were desirous of having the best constructed farming utensils and implements, and who were determined to give this plough a fair trial, he was enabled by the result of various trials, to establish its preference over all others—since which it has been generally adopted in that part of North Britain, and many have been exported to England, France, the United States and British North America.

The original plough that was in this city was wholly made of cast and malleable iron, but your committee give a preference to such as are partly of iron, and partly of wood, as the cast iron ones once strained cannot be repaired, though on loamy, sandy and alluvial soils they are not so subject to injury, and of course on such soils are better adapted and are more durable than those constructed partly of wood.

The dimensions of the original also vary from

Mr. Rodgers', as your committee have been informed, but whether such variation will on proof be beneficial or detrimental, cannot possibly be ascertained unless thoroughly proved on a trial conducted by experienced ploughmen.

The objections your committee have thought advisable to present, are that the plough in question is not calculated for lands encumbered with roots and stumps; that it is doubtful whether the share is not liable to be broken where the stones are large and very firm in the soil; that the point of the share is bent downward rather too much; that the heel of the plough is rather too wide when compared with the sock; that the wing of the mould-board extends outwards too much, and is so covered as to operate against the plough's clearing itself; that probably the beam and still would admit of being made longer, by which the plough would work more smooth and steady.

On the other hand, they admire the breast of the plough as a first rate piece of workmanship, and recommend a thorough trial of this plough in various soils, and on flat and hilly land, against the ploughs now generally in use, as the only effectual mode of ascertaining its essential properties.

Your committee cannot conclude their report, without stating, that in the townships of Galway, Charlton and Broadalbin, the Scotch plough is coming into general use, and that in the course of a year or two its utility and applicability to the soils in those townships will be fully ascertained, at the same time this Society will no doubt avail itself of every op-

portunity in promoting every branch of agriculture, both in regard to its husbandry and implements, and make such exertions as are compatible with their resources, in seconding the laudable views Mr. Rodgers has so spiritedly entered into. Which is respectfully submitted to the Society.

S. DE WITT,
GEO. CLARKE.

[Since the date of this report, Mr. Rodgers' plough has been extensively used in several towns in Saratoga county, and also in other places. From a number of testimonies that he has obtained, it appears to be the decided opinion of farmers, that this plough will require from one third to one quarter less draft than others, and that it is more perfect in its operation.]

LIST OF MEMBERS,

Elected since Jan. 25, 1817.

Nathan Williams,
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LIBRARY OF THE SOCIETY.

The following Books have been added to the Library of the Society since the last publication.

Transactions of the Society instituted at London for the encouragement of Arts, Manufactures and Agriculture—36, 34, 35, and 36th vols.

Index to the first 25 vols. 1 vol. oct.

Repertory of Arts, Agriculture and Manufactures, 2d series, 21 vols.

Analytical Index to the first 16 vols. 1 vol.

Annals of Philosophy, Chemistry and the Arts, 15 vols. oct.

Principles of Mechanics, by Emerson, 1 vol. quarto.

Dickson's Agriculture, 2 vols. quarto.

American Artillerist's Companion, 2 vols. oct. and a quarto vol. of Plates.

Transactions of the Agricultural Society of Massachusetts, 2 vols. oct.

Henry's Chemistry, 2d American ed. 1 vol. oct.

Emporium of Arts and Sciences, 5 vols. oct.

Cooper on Gas Lights, and Introductory Lecture on Chemistry, 1 vol. oct.

A Treatise on Internal Navigation.

An Outline of Mineralogy and Geology, by W. Phillips.

A System of Mineralogy, by Robert Jameson, 3 vols. 2d edition.

Rauch's Recipts for Dyeing.

Memoirs of the Academy of Natural Sciences of Philadelphia, 1 vol.

A Treatise on Bees, by Robert Huish, 1 vol.

Aikin's Chemical Dictionary, 2 vols. quarto.

Cleaveland's Mineralogy, 1 vol. octavo.

Cuvier's Theory of the Earth, 1 vol. octavo.

History of the Royal Society, 1 vol. quarto.

Keith's Botany, 2 vols. octavo.

Memoirs of the Wernerian Society, 2 vols. octavo.

Mawe's Travels in Brazil, 1 vol. oct.

Michaux's North American Sylva, 2 vols. quarto, and 1 No. of vol. 3.

Muhlenburgh on the American Grasses, 1 vol. oct.

M'Clure's Geology, 1 vol. octavo.

Nuttall's Genera, 1 vol. octavo.

Philosophical Transactions of the Royal Society, London, abridged by Drs. Shaw, Hutton and Pearson, 18 vols. quarto.

Report of a Committee of the London Society of Arts, &c. on a Mode to prevent the Forgery of Bank Notes, 1 vol. octavo.

Sinclair's Code of Agriculture, 1 vol. oct.

Transactions of the American Philosophical Society, 1 vol.—2d series.

Thompson's Chemistry, 4 vols. oct.

The complete Grazier, 1 vol. octavo.

Linnæus' Genera of Plants, 1 vol.

Murray's System of Vegetables, 1 vol.

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